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ABSTRACT

Although designed as a resource for teachers in the Guilford County (North Carolina) School System, this guide contains information applicable to most K-12 curricula. There are five color-coded sections, each devoted to specific grade levels: K-3, 4-6, 4-9, 10-12. The Appendices include field trip possibilities, an energy use checklist, and illustrations. Each grade level section contains energy concepts, related activities, and resources for the teacher. There is an annotated bibliography containing entries for all resources listed at the end of each section. This resource guide is not intended to provide an exhaustive list of concepts, activities, and resources, but rather is a working tool to be amended and modified by teachers. An interdisciplinary and integrated approach is used throughout the guide. (MA)

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ENERGY CONSERVATION EDUCATION RESOURCE GUIDE

U.S. DEPARTMENT OF HEALTH,
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GUILFORD COUNTY SCHOOL SYSTEM

NORTH CAROLINA

July, 1978

SE 025 258

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The preparation of materials for the project's activities and the Energy Conservation Education Resource Guide has been aided by the able assistance of four typists: Mrs. Lynn Atkins, Mrs. Donna Gannon, Miss Joy Hyatt, and Mrs. Mattie Robbins.

PREFACE

The dwindling supply of natural energy producing resources is cause for concern at local, state, national, and even international levels. This concern presents a challenge to educators to offer programs that address the issues related to energy conservation and explore alternative sources of energy. To do this, an on-going program which emphasizes energy conservation education must be initiated at local education agency (LEA) levels.

Within a LEA teachers, administrators, and curriculum support staff must determine what is needed to offer a program that prepares students to deal with the fact of dwindling supplies of traditional energy sources. In this case, the materials on energy conservation are numerous, but they need to be organized for use in various grade levels and subject areas. One form of organization is a resource guide which includes concepts, suggested activites, and relevant resources. Such a guide or tool then can be used as energy conservation education is incorporated into an on-going program.

During the spring and summer, 1978, a number of members of various instructional staffs in the Guilford County School System has contributed to the development of such a tool, i.e., a resource guide on energy conservation, which can be used by the system's teachers to provide an interdisciplinary, integrated approach to the subject for students in grades K-12. The Energy Conservation Education Resource Guide is now ready for use by the instructional staff in the system's schools.

Michael D. Priddy

Chairman, Steering Committee,
Energy Conservation Education Program,
and
Director of Secondary Education,
Guilford County School System

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INTRODUCTION

The Energy and Education Picture - Now!

Use of the Energy Conservation Education Resource Guide

INTRODUCTION

THE ENERGY AND EDUCATION PICTURE - NOW!

One prominant aspect of the present energy situation is confusion. Over a year after the President of the United States labeled the "energy crisis" as the moral equivalent of war, we have no clear national energy policy, more questions than answers, and a Congress deadlocked over the question of which additional tax and price control breaks to give to oil and natural gas companies. Certainly, those of us working on the local level should take heed of this inaction and indecision and take more responsibility for such problems which will inevitably affect our lives.

There are some factors about which most experts do agree. At the present time, the world is relying heavily on the fossil fuels: coal, oil, and natural gas. All fossil fuels are finite resources, and additional supplies will not be produces naturally for millions of years. At present rates of increasing consumption, oil and natural gas will be in seriously short supply even during the lifetimes of most people presently inhabiting the planet.

As a nation we have grown to expect cheap sources of power; and in fact, many people have lived more years watching electric rates decline than they have with the recent phenomenon of increasing rates for electrical power. Within the life style which we developed around cheap energy, people acquired homes so large that they didn't even set foot inside some rooms for months at a time. Even so, these rooms consumed energy for heating and cooling. In many cities, travel has moved from an extensive system of public transportation to nearly total reliance on individual vehicles in a span of thirty years.

The average American uses approximately four times as much energy as an average inhabitant of the rest of the world. We use almost twice as much as people in the most advanced western European countries, where the standard of living exceeds our own. Currently, the United States with 6% of the world's population is consuming over 33% of the world's energy resources.

To the ethical man who is concerned about what is fair, this conspicuous consumption creates an individual dilemma. Additionally, it is creating a serious problem for the United States in our relations with other member states of the world community. As our economy is being strained to the breaking point by the cost of imported pertroleum, the resulting inflation and our balance of payments deficits are reaching unprecedented levels. Underlining the irritation felt by other nations at these patterns, the heads of several friendly foreign governments told the American President at the 1978 Bonn, Germany, Economic Summit meeting, that they frankly looked on Americans as being wasteful and extravagant in their use of energy.

For public education, the re-shaping and forming of more practical attitudes will be a long and challenging process. It is the challenge of finding the facts in a confusing world. It is the challenge of learning to teach values and attitudes of conservation in the face of a society geared for consumption. It is the challenge of teaching new values and attitudes to classroom children in an atmosphere of freedom. It seems it would be easier if someone would just tell us what to do and how to do it.

These are the issues at the heart of this challenge. Who is going to take the responsibility? Responsibilities which are ultimately taken on a higher level inevitably mean loss of freedom on the local level. Will we accept the educational challenge that the energy issue has given us? For the individual classroom teacher facing the challenge of energy conservation education, the professional decision regarding the boundries of freedom, structure, and responsibility taken by himself and for his students is at the highest level of educational functioning.

As educators, we accept the fact that as we begin the process of energy conservation education, we will be wrong at times. The process of being wrong, and the struggle to find a better answer is an indispensible part of education in democracy. Energy conservation education will take its full measure of us as professionals, as we continue working to learn what we should do. As coordinator for the Guilford County Energy Conservation Education Project, it has been my experience that we have the willingness, intelligence, and the skills necessary to meet this challenge. This first edition of the Energy Conservation Education Resource Guide is our initial effort to assume our responsibilities.

David Kingsley
Project Coordinator
Energy Conservation Education Program

Use of the ENERGY CONSERVATION EDUCATION RESOURCE GUIDE

General Use

The purpose of the Energy Conservation Education Resource Guide (hereafter referred to as Guide) is to provide a resource for teachers in the Guilford County School System, as they integrate energy conservation education into the K-12 curriculum. Each section of concepts, related activities, and resources was developed by teachers who are teaching at the relevent grade level. In all cases, an exhaustive list of concepts, activities, and resources are not provided, as the Guide is a first effort and a working tool.

In using the Guide, one rule is to carefully scan both the relevant sections as well as sections around which your interest centers. For example, a sixth grade teacher would be likely to find materials of interest ranging at least from the fourth to the eighth grade. This situation will be similar at other levels.

Secondly, the concepts will be a key to locating specific areas of interest. This means that when you are scanning, it will be most useful to read the concepts first. When a concept is identified which seems interesting, a list of suggested activities and resources supporting that concept will be found in the related activities and resource section. A concept has the same number in the concept listing and the activities and resource section, so that the content suggestion relating to a given concept can be found easily. There is some variation among formats for concept listings in the four sections (i.e., K-3, 4-6), since grade groupings lended themselves to different types of concepts.

Other resources are included in the Guide. At the end of each section (i.e., K-3, 4 - 6) you will find an annotated bibliography containing entries for all resources listed in that section. Following the section on Concepts, there is a section entitled Additional Information Resources. Also, Appendix A contains a listing of field trip possibilities with contact persons identified and comments on utilization.

This Guide is designed as a working tool; therefore, the user will find some extra pages in each section. As new concepts, activities, and resources are identified, they should be added to the Guide.

Media Services

In each of the grade-level sections of the Guide is a bibliography of materials. The Media Specialist in an individual school might find it useful to check the school's media collection against these bibliographies, marking in the Guide each item which the school owns. Teachers could then use this information in making request for materials to be purchased as well as in planning units to be taught to their classes.

Exceptional Children

Because this guide is set up on levels K-12, it includes concepts suitable for students at all levels. The teacher of an exceptional child can select the concepts which are on the level of that particular child, knowing the suggested activities and materials will also be on that child's level.

CONCEPTS, ACTIVITIES, AND RESOURCES

Kindergarten thru Third Grade

Fourth Grade thru Sixth Grade

Seventh Grade thru Ninth Grade

Tenth Grade thru Twelfth Grade

Kindergarten thru Third Grade[1]

Joanne Caldwell	Earline Huffman
Rita Childers	Faye Marks
Julia Fields	Jackie Poe
Barbara Forsythe	Cindi White
Bettye Holmes	Ruby White

Introduction

Energy conservation is a matter of immediate concern to all of us. Therefore, we should not treat it as a once-a-year unit of study, but we should correlate it with the rest of our curriculum. We need to teach not only facts; but more importantly, we need to change the attitudes which years of wasteful habits have instilled in our society.

In the early nineteenth century, Americans faced another "energy crisis." Population growth and economic expansion necessitated the development of new energy sources beyond human strengths, wood fuel, and animal and water power. Our prosperity today is a result of the new energy sources--coal, steam, and petroleum--that were developed at that time. Today, we face a similar energy crisis. What kinds of new energy sources, such as nuclear power or solar energy, will be part of the solution?

Energy! Energy! What does it mean?
It does our work.
It keeps us clean.
It cooks our food.
It drives our cars.
It makes us the freedom lovers we are.
It preserves our food.
It washes our clothes.
It takes us down to the beach in droves.
It helps us in every phase of living.
Let's use it wisely or it will soon stop giving.

---

[1] Representatives from grades K-3 participated in the development of this section of the Guide. School representatives identified possible resources in spring, 1978, and the individuals listed above developed the concepts and activities in this section and matched resources to them.

KINDERGARTEN THRU THIRD GRADE

List of Concepts

Kindergarten thru First Grade:

1. The human body produces energy.
2. Moving water and moving air have energy.
3. The sun is a source of solar energy.
4. Wood can supply heat.
5. Gas, coal, and petroleum are fossil fuel sources of energy.
6. Electricity is a kind of energy.
7. The family uses energy for cooking, heating, lighting and transportation.
8. Everyone needs to conserve energy in and around the home.

Second Grade:

1. The sun is the source of all energy.
2. There are many energy resources, such as: oil, coal, gas, air, water, electricity, and waste materials.
3. Our school uses energy, and our school can conserve energy.
4. Our community uses energy, and our community can conserve energy.
5. Energy affects our lives and environment--yesterday, today, and tomorrow.
6. Each of us has a responsibility to conserve energy, if we are to avoid serious shortages.

Third Grade:

1. Energy is the ability to do work.
2. Matter may be a solid, a liquid, or a gas.
3. Heat produces changes in matter.

KINDERGARTEN THRU THIRD GRADE

4. The sun is a source of energy for our entire solar system.

5. The sun is the earth's chief source of energy.

6. Energy from the sun may be converted into heat and electricity.

7. Green plants capture the energy from the sun.

8. Life is constantly renewed as plants, animals and soil interact.

9. Some vehicles used for transportation are energy wasters.

10. Oil is converted into gasoline, diesel fuel, and kerosene.

11. When fuels are burned they release energy which enables vehicles to function.

12. Vehicles used for transportation can pollute land, air and water.

First Grade

Concept 1

The human body produces energy.

Activities:

a. As an introduction to body fuels, see activity suggested on pp. 5-6, The Energy We Use - Grade 1.

b. Have a discussion of what food provides for the body. See Award Winning Energy Education Activities, p. 11.

c. Make a list of the ways we use personal energy each day. See Award Winning Energy Education Activities, p. 1.

d. Sit, walk, hop, climb, run. Discuss which activity used the most energy by deciding which makes you the most tired.

e. Use Hap Palmer, Slim Goodbody and other records for movement activities. Discuss the movement activities in terms of energy used.

f. Art activity: Fold a paper in half. On one side draw a picture of yourself eating your favorite food; on the other side draw what you are going to do with the energy supplied by that food. See The Energy We Use, p. 6.

g. Study TAM Body model by taking a field trip to the Natural Science Center. (Contact center for more information).

Resources:

Books

a. The Energy We Use.

Pamphlets/Booklets

a. Award Winning Energy Education Activities for Elementary and High School Teachers.

Records

a. Burstein, John. "Slim Goodbody Presents the Inside Story".
b. Palmer, Hap. "Getting to Know Myself".

First Grade

Concept 2

Moving water and air have energy.

Activities:

a. Weigh empty and full balloons on a balance scale to see that air has weight.

b. Fill a balloon with helium, label it with a child's name, address and telephone number;and let the wind carry it away. Let newspapers, radio, and TV stations know of your project, so the public will know to call when the balloon is found. Make a chart or graph to see which balloon traveled the greatest distance.

c. Have children blow up balloons, then use them in body awareness activities, such as bounce the balloons on body parts, balance them on other parts, etc. Use the record "Dance-A-Story about Balloons".

d. To see how moving air can move things, make pinwheels. Use them outside, or blow on them.

e. Make oriental fish kits (See Appendix C, illustration #2).

f. Make a sail boat by carving a bar of Ivory Soap and making a paper sail or use a cut off ½ pint milk carton. Use in water table and use fan for moving air.

g. Make a wind chime: use sea shells that have holes or are easily punctured, biscuit can tops, or make potters clay chimes - be sure to punch holes before firing. Or - use your imagination!

h. Dry doll clothes: outside, inside; cold, hot days; windy, calm days. Discuss differences in drying times.

i. Parachute activities: stand children around the outer edge of a parachute - experiment by holding 1 or 2 hands, walking and running in a circle while holding taut - lift the parachute above your head etc.

j. Blow through straws into a bowl of water or onto objects that move easily.

k. Blow painting - blow tempera paint through a straw onto paper.

l. Make a chart of important words concerning wind and air for the children to use in creative writing activities or as copy excercises.

First Grade

m. "Energy Word Box" - have each child make a box or cover a can to keep word cards in. Make this an individual, on-going project by allowing children to copy words, point out letters, give initial sounds, read the word, depending on their particular level. Encourage children to add a word after mastering the previous one.

n. Mr. "Wh" a heavy balloon decorated with arms, legs and facial features to use a phonics aide for the "wh" sound (as in "wind").

o. Experiment with dancing scarves.

p. Sing "Up, Up, and Away" with the 5th Dimensions.

q. Whip cream to show that air takes up space.

r. Use a simple tire pump to show the force of air.

s. Follow the dots pictures can be made for kites, balloons, a dam, etc.

t. Make a wind gauge with heavy cardboard, straw and brad. The wind will blow the straw to measure wind speed. Check each day. Make a weekly chart. (See Appendix C, illustration #5).

u. Go on a field trip to a dam or mill. Examples: Baills Mill, Oak Ridge; Oak Hollow Dam, Hwy 68, near High Point. Children can draw pictures or write their own stories or dictate them for the teacher to write.

v. Good background information on water power and directions for making water wheel can be found on pp. 23-30 in The Energy We Use - Grade 1.

w. Experiment by feeling still and running water and comparing the sensations. Use the wind-air bulletin board to reinforce this concept and develop language arts skills (See Appendix C, illustration #1).

Resources:

Books

a. The Energy We Use.

Records

a. "Dance-A-Story about Balloons".

First Grade

Concept 3

The sun is a source of solar energy.

Activities:

a. Put boxes outside - one painted black, one white. Later check to see which box is warmer. Touch lighter and darker objects that are in the sun and shade to see which holds more heat.

b. When you are growing plants in the classroom, put one or more in a dark place to see the effect of no sunlight.

c. Encourage creative writing and drawing of how our world would look without the sun. Develop the understanding that the sun is our source of life.

d. Use a magnifying glass to focus on the sun's rays on a sheet of paper. Observe the heat created by collecting and channeling this energy.

e. For good background information, see pp. 11-12 in The Energy We Use - Grade 1.

f. For other related activities, see "Solar Energy" folder in the Science Activities in Energy packet.

g. Take a field trip to A & T State University (See Appendix A: Field Trip Possibilities for information on site).

h. Take a field trip to the High Point Environmental Center (See Appendix A: Field Trip Possibilities for information of site).

Resources:

Books

a. The Energy We Use.

Others

a. Packet of Science Activities in Energy. "Solar Energy."

First Grade

Concept 4:

Wood can supply heat energy.

Activities:

a. Make a collage of different kinds of wood or to show the different ways wood is used.

b. Look through magazines and draw or list different ways wood supplies heat, i.e., woodstove, fieplace, campfire, etc.

c. Let children bring in samples of unburned wood, burned wood, and ashes. Compare the difference. Discuss the results of burning wood and heat.

d. Set up 3 short tin cans. Put a small piece of wood in each: 1 wet, 1 green, 1 dry-aged. Next, try to light each and have children observe results. Use this activity to show the need for dry wood in fireplaces. Emphasize caution outdoors with brushes and forest fires during dry seasons.

Kindergarten thru Third Grade

First Grade

Concept 5

Gas, coal, and petroleum are fossil fuel sources of energy.

Activities:

a. Take a field trip to the Greensboro Natural Science Center and see the display of dinosaurs and fossils.

b. Show examples of fossil fuels (coal, gas, oil). Describe likeness and differences observed through the senses.

c. For a language arts activity see pp. 23-24 in *The Energy We Use - Grade 1*.

d. Make a collage of magazine pictures of fossil fuel used at home.

e. Read cartoon story in *Energy Activities with Energy Ant*, pp. 1-9.

Resources:

Books

a. *The Energy We Use*.

Pamphlets/Booklets

a. *Energy Activities With Energy Ant*.

First Grade

Concept 6

Electricity is a kind of energy.

Activities:

a. Battery and bulbs experiments can be set up. You need a 1.5 volt dry cell, a mini-lamp with a porcelain socket and insulated copper wire. Lay different objects between the wire and a terminal to see what will and what won't conduct electricity. (wood, plastic, rubber, paper, copper pennies).

b. Set up experiment to show how electricity produces heat. Run one wire from the positive to the negative terminal. The wire will get hot (See Appendix C, illustration #4).

c. Make a robot out of boxes. A series circuit can be placed inside so that the robot can have eyes that light up. (See Appendix C, illustration #4).

d. Make a collage using pictures of electrical items used in the home.

e. Play "I Spy" with emphasis on description of electrical and non-electricial items.

f. Set up two electricial burners for cooking eggs. Put one burner on "high" and one on "low". Crack eggs after 15 minutes. Which cooks faster? Which is hotter?

g. Read Ben and Me to give children some background information on Benjamin Franklin's inventions.

h. Set up a self-correcting match board. Words dealing with electricity can be matched with pictures using bulbs and batteries. When the child has the correct answer, the bulb will light when touched with the proper wire (See Appendix C, illustration #6).

i. Make a word chart on electricial items similar to illustration #3 (See Appendix C). Have children paste the correct picture above the word on their sheet.

Resources:

Books

a. Lawson, Robert. Ben and Me.

Kindergarten thru Third Grade

First Grade

Concept 7

The family uses energy for cooking, heating, lighting, and transportation.

Activities:

a. Use the energy checklist for class discussion and for making graphs (See Appendix B).

b. Draw a cross section of a house and put the appropriate energy users in each room.

c. Make graphs of how children's homes are heated.

First Grade

Concept 8

Everyone needs to conserve energy in and around the home.

Activities:

a. Choose an "energy zap" person each day to be responsible for turning off lights, turning off record player, closing windows, etc.

b. Have the children draw pictures of their favorite activities. The group can then classify them into two groups, those that use body energy and those that use other energy.

c. Grow a tree from fruit seeds in the early fall and watch it grow until school gets out. The child becomes aware of how long it takes trees to grow and the importance of using them wisely and carefully. Incorporate Arbor Day into the activity.

d. Measure the amount of water used with tub baths and shower baths by having children (1) take a tub bath at home and marking the level of the water with a piece of tape and (2) take a shower bath the next time with a plugged drain to compare the amount of water used during the two baths.

e. Have discussions which focus on using body energy as opposed to machine energy.

f. Encourage children to limit their daily use of paper.

g. Make a graph of the children who ride a bus and those who ride in a car to school. Encourage the saving of gas by riding the bus.

h. Develop a puppet show with hand made puppets called Conservation Charlie and Wasteful Wanda.

i. Make a mural of all the different ways of traveling without using mechanical energy.

j. Make a display of disposable products which waste natural resources,e.g., plastics, aluminum cans.

Kindergarten thru Third Grade

First Grade

k. Do the "Energy Boogie" to the tune of the Hokey Pokey.

Turn a light off he ,
Turn the TV off there,
Get a good book out,
And you read it throughout.

Chorus:

You do the energy boogie
And you turn yourself around,
That's what it's all about.

ENERGY BOOGIE!!

You turn the heat down low,
Put a 'boggin on your head,
Find an extra sweater,
Don't sit - move instead.

Repeat Chorus -

l. Take a field trip. Examples: Old Salem, Winston Salem; Fire Department; Greensboro Energy Commission (See Appendix A: Field Trip Possibilities for information on sites).

Kindergarten thru Third Grade

Second Grade

Concept 1

The sun is the source of all energy.

Activities:

a. Teach the Blackfoot Indian Sun Dance (See the World Book Encyclopedia, Vol. B).

b. Take a field trip to a farm to study the uses of solar energy.

c. Make a survey of ways that solar energy is used in a community.

d. Burn paper or leaves by focusing rays of sun through a maynifying glass.

e. By using the sense of touch, compare the amount of heat in similar articles, one of which is in direct sunlight and another in the shade.

f. Place a container with cold water and a thermometer in direct sunlight. During the day, check the change in the temperature of the water.

g. Show that the sun is a source of energy by using a solar motor or radiometer.

h. Construct a solar hot dog cooker by lining an open umbrella with aluminum foil. Place hot dogs inside and broil in the sun.

i. Take a field trip. Exmaples: Sunovations or High Point Environmental Center (See Appendix A: Field Trip Possibilities for information on sites).

Resources:

Pamphlets/Booklets

a. A Better Place To Be.

Periodicals

a. De Dapper, Joyce. "380 Million Billion Billion Watt Light Bulb".
b. "Sun Power".
c. Watkins, Rupert. "Solar Energy for Tobacco Curing".
d. Wilhelm, John. "Solar Energy: The Ultimate Powerhouse".

Second Grade

Concept 2

There are many energy resources, such as: oil, coal, gas, air, water, electricity, and waste materials.

Activities:

a. Provide students with information to help develop an awareness and understanding of major energy resources.

b. Demonstrate wind power by making and using windmills or pinwheels.

c. Demonstrate steam power by boiling water, and using steam to turn pinwheel.

d. Demonstrate physical energy by dancing and exercising.

e. Tie unblown balloon and place it on heated radiator. The heated air within the balloon will cause it to expand.

Resources:

Books

a. Federal Energy Administration. My Energy Book.
b. Ginn Science Program, Introductory Level B (basal text).[1]

Pamphlets/Booklets

a. Living With Energy.

Periodicals

a. Garber, Nancy. "Energy From Inside the Earth".
b. Hamilton, Roger. "Can We Harness the Wind?"
c. Honck, Oliver A. "The Best Present of All".
d. Weaver, Kenneth. "The Power of Letting Off Steam".
e. Weaver, Kenneth. "The Search for Tomorrow's Power".
f. "Wind Toys".
g. Young, Gordon. "Will Coal Be Tomorrow's Black Gold?"

Films

a. Electric Safety: A to Zap.

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[1] Basal texts are not included in the Annotated Bibliography.

Second Grade

Concept 3

Our school uses energy. Our school can conserve energy.

Activities:

a. Take a tour around the school to discover energy users. Discuss the tour, draw pictures about it and write stories about it.

b. Collect pictures of objects that consume energy.

c. List ways to conserve energy at school.

d. Discuss the school's heating system. Identify some alternative sources of heat for the school.

Resources:

Books

a. Brennan, Matthew J. People and Their Environment.

Pamphlets/Booklets

a. Schools Can Conserve Too.
b. Strategies for Wise Use of Energy.

Second Grade

Concept 4

Our community uses energy. Our community can conserve energy.

Activities:

a. Build a model community. Chose the best energy source to use. Compare it with a real community.

b. Discuss how an energy shut-off would affect the jobs of students' parents.

c. Make a collage of energy terms and pictures.

d. Make a booklet on the uses of energy in the community.

e. Describe how a farmer depends on the sun's energy.

f. Draw pictures of community workers saving energy.

g. Write experience stories after field trips (See Appendix A: Field Trip Possibilities for information on sites).

h. List community workers whose jobs depend on the continued supply of various energy sources.

i. List jobs, and discuss how each comsumes energy.

j. Visit a service station, farm, etc. to observe consumption of energy.

Resources:

Books

a. Brennan, Matthew J. People and Their Environment. pp. 11-30.

Pamphlets/Booklets

a. Community Workers and the Energy They Use - Grade 2.
b. Valuing the Environment. p.94.

Second Grade

Concept 5

Energy affects our lives and environment - yeaterday, today and tomorrow.

Acitivites:

a. Compare energy crisis of 1800's with present energy crisis. Take a field trip to Old Salem (See Appendix A: Field Trip Possibilities for information on sites).

b. Have a school-wide Heritage Fair using displays from past school activities. Identify the types of energy used to build or produce the displays.

c. Compare energy usage yesterday, today, and tomorrow.

d. Have students draw or describe future energy machines, etc.

e. Have students do creative writing (e.g., If I were living in the year 2000, my (car, home) would be (powered, heated) by _________).

Resources:

Books

a. Brennan, Matthew J. People and Their Environment.

Pamphlets/Booklets

a. Award Winning Energy Education Activities for Elementary and High School Teachers.
b. Sources, Resources and Choices.

Second Grade

Concept 6

Each of us has a responsibility to conserve energy, if we are to avoid serious shortages.

Activities:

a. Survey the classroom for electrical appliances.

b. Make a list of electrical appliances in the classroom.

c. Name things in the classroom which require fuel to be manufactured.

d. Discuss how energy can be conserved in the classroom.

e. Survey other parts of the school. Ask the custodian how the school is heated. Where does the elctricity enter the school? Where else in the school is energy used? Discuss how fuel energy can be saved in the school.

f. Discuss use of fuel for transportation to and from school.

g. Ask parents to go through packages from one trip to the grocery store and collect all wrappings to see the waste.

h. Discuss energy waste in the school and community.

i. Make a bulletin board using pictures to classify different ways we can save on energy, such as: appliances, transportation, recreation, community buildings, stores.

j. Use an experience technique to stress the depletion of natural resources. Discuss the fact that we are depleting fossil fuels, when we waste energy.

k. Take field trips around the community to see energy conservation (See Appendix A: Field Trip Possibilities for information on sites).

Resources:

Books

a. Brennan, Matthew J. People and Their Environment.
b. Irving, Robert. Energy and Power.

Pamphlets/Booklets

a. Energy - Why We Must Conserve It Now.
b. Valuing the Environment. pp. 93-99.

Third Grade

Concept 1

Energy is the ability to do work.

Activities:

a. See the filmstrip Energy Does Work. Discuss the kinds of energy you use each day.

b. Experiment with toys to show different kinds of energy. Examples: Line up dominoes, push the first one over; use rubber-band powered toys; build a Tinkertoy structure with pulleys; blow up a balloon and let it go; use batteries to ring bells. Discuss the kind and source of energy in each experiment.

c. Let each child choose one source of energy (wind, water, sun, electricity, etc.) and draw pictures to show how it moves or changes things. (Example: wind-blowing windmill, pinwheel, etc).

d. Make a list of each energy-using machine in your home. Consider the job it does. Find out how your grandparents and your parents did that job. List which machines you could do without. (Use Activity Master 2 "Electricity - Who Needs It" from packet "Your Energy World").

e. Use Activity Master 1 from Schools Can Conserve, Too.

Resources:

Pamphlets/Booklets

a. Schools Can Conserve, Too.
b. What Happens When You Turn on the Light?

Filmstrips

a. Energy Does Work.
b. Exploring Matter and Energy.
c. Finding Out About Simple Machines.
d. More Science Experiments.
e. Toys at Work.

Others

a. "Your Energy World".

Kindergarten thru Third Grade

Third Grade

Concept 2

Matter may be a solid, a liquid, or a gas.

Activities:

a. Have a child make a collection of pictures showing different kinds of matter. Classify them according to the states of matter.

b. Use a field trip to a bowling alley (let the children bowl) or use a class softball game to demonstrate that matter moves because of energy.

c. Do the activities and experiments concerning pollutional waste as related to matter in Lesson Cluster 7, "Earth's Important Stories", p. T-148, *Concepts in Science*.

d. Use as a vocabulary list or spelling game: *living*, *polluted*, *waste material*, *big cities*, *polluted air*.

Resources:

Books

a. *Concepts in Science* (basal text).[1]

Filmstrips

a. *Common Rocks and Rock Forming Minerals*.
b. *Energy, Force, and Motion*.
c. *Exploring Matter and Energy*.
d. *Finding Out About Heating Solids, Liquids and Gases*.
e. *Forms of Energy*.
f. *Land Forms of Running Water*.
g. *Matter and Molecules*.
h. *Solids, Liquids, and Gases*.
i. *Story in the Rocks*.
j. *The Environment*.

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[1] Basal texts are not included in the Annotated Bibliography.

Third Grade

Concept 3

Heat produces changes in matter.

Activities:

a. Conduct cooking activities. For example, show the melting of butter, cooking of an egg, and cooking of popcorn.

b. Show that some materials are good conductors of heat and some are not by using aluminum foil, small iron nails, pieces of copper wire, and styrofoam cups in heat transfer experiments.

c. Have students use thermometers to measure the temperature of cold water and hot water.

d. Observe the changes of water to ice. Mix ice and rock salt in a bowl. Pour some water into a glass. Put the glass down into the ice and salt. Construct a graph showing the temperature of the water in the glass every two minutes.

e. Perform science activities in "Conservation" from the packet of "Science Activities In Energy".

f. Identify expansion and contraction effects, e.g., in the apparent softening of a tire on a cold day.

g. Fill two glasses with cold water. Add a drop of coloring to each. Put one glass in very warm water. Observe both glasses. In which glass does the color move more?

h. Have students make a list of things used in their homes that produce heat.

Resources:

Books

a. Elementary School Science, Level 3 (basal text).
b. Modern Science, Level 3 (basal text).

Third Grade

Pamphlets/Booklets

a. Energy Activities With Energy Ant.

Filmstrips

a. Forms of Energy.

Others

a. "Science Activities in Energy".
b. "Your Energy World".

Third Grade

Concept 4

The sun is a source of energy for our entire solar system.

Activities:

a. Discuss the hot and cold side of the moon and what causes the phenomenon.

b. Conduct research to find the temperature of each planet. Make a bulletin board to show how distance from the sun affects their temperature.

c. Use the record "Energy and Motion Songs" which gives facts about the bodies of the solar system.

d. Set up a learning center where children can record the daily temperatures outside.

Resources:

Filmstrips

a. Finding Out About the Solar System.
b. Solar System - Family of Planets.

Records

a. "Energy and Motion Songs".

Third Grade

Concept 5

The sun is the earth's chief source of energy.

Activities:

a. Perform experiments with solar cells. See pp. 30,31, *Concepts in Science*.

b. Plan an area of study using the packet "Science Activities in Energy".

c. Have a school wide "Sun Day" using examples and models of solar energy. Ideas may be obtained from the Greensboro Natural Science Center.

d. Plan a puppet show showing how the earth depends on the sun for energy.

e. Plan units of study on solar heating, including discussions of how homes can be made more energy-efficient by adding insulation, doing small carpentry work, etc.

f. Have students write letters to government officials and organizations and to private companies seeking information.

g. Create games, puzzles, or phonics drills which use the concept of solar energy as a focus.

h. Design art projects such as collages or seed prints showing the sun as the focal point of earth's energy.

i. Make a sundial and perform various experiments with it.

Resources:

Books

a. *Concepts in Science* (basal text).

Pamphlets/Booklets

a. *A Better Place To Be*. p. 20, activity 1.
b. *The Mini-Page Activity Book*.

Third Grade

Periodicals

a. "Energy 8: Sun Power", Intellectual Digest.
b. "Solar Energy - Prospects for Its Large-Scale Use". Science Teacher.

Filmstrips

a. Seasons.
b. Sun: Keeping the Earth Warm.

Records

a. "Energy and Motion Songs".

Third Grade

Concept 6

Energy from the sun may be converted into heat and electricity.

Activities:

a. Perform cooking activities outside in the sun using aluminum foil.

b. Perform activities listed in the packet, "Science Activities In Energy".

c. Have the student learn the song "Solar Energy" from the record "Energy and Motion Songs".

d. Take a field trip to the Greensboro Natural Science Center and the Environmental Center on Penny Road in High Point (See Appendix A: Field Trip Possibilities for information on sites).

e. Have people come in and talk to children about solar energy. For example, Mr. Charles Eakes from Sunovations (See Appendix A: Field Trip Possibilities for information).

f. Have a puppet show discussing the advantages of solar heating.

Resources:

Periodicals

a. Science and Children.

Records

a. "Energy and Motion Songs".

Others

a. "Science Activities in Energy".

Third Grade

Concept 7

Green plants capture the energy of the sun.

Activities:

a. Plan and build a small outdoor garden.

b. Conduct experiments which place plants in and out of sunlight to show relative differences in growth.

c. Take part in the project, "Adopt a Tree", p. 28, A Better Place To Be.

d. Write letters requesting information on Forests and Conservation to The Wilderness Society, 729 15th St., N.W., Washington, D.C. 20005.

e. Have children write a play featuring the idea that green plants are the food-supplying units of our planet.

f. Test leaves and plants in light and dark situations to determine the results of exposure to sunlight. Perform experiments in which chlorophyll is "masked", p. 237, Concepts in Science.

g. Take a field trip to the Environmental Center, Penny Road (See Appendix A: Field Trip Possibilities for information on site).

Resources:

Books

a. Concepts in Science (basal text).

Pamphlets/Booklets

a. A Better Place To Be.
b. The Mini-Page Activity Book.

Filmstrips

a. An Introduction to Plants.
b. How Plants Make Food.
c. Seed Magic: Life Story of a Bean.

Third Grade

Concept 8

Life is constanly renewed as plants, animals, and soil interact.

Activities:

a. Use transparency from "Ecology and Energy Action Pack" to show the food chain.

b. Do an experiment with plants, showing one which is properly watered and fertilized and one which is not.

c. Take the class on a nature trail, identifying evidence of plants and animals, pointing out their interaction, showing that each living thing takes from the community and each living thing gives back to the community.

d. Set up a small community in your classroom (a terrarium or aquarium) to demonstrate this idea.

e. Investigate the theory of fossil fuel with your class pointing out the long-range interaction here.

Resources:

Filmstrips

a. Communities of Living Things.
b. Energy Flow in a Community.

Others

a. "Ecology and Energy Action Pack".

Third Grade

Concept 9

Some vehicles used for transportation are energy wasters.

Activities:

a. Have children take a field trip to (1) a bicycle shop, (2) a new car dealer (can acquaint students with the economy of various models, the difference in city and highway milage, and the meaning of miles-per-gallon) and (3) a train station (maybe take a field trip on a train).

b. Have students bring in magazines advertisements and automobile brochures on gasoline milage.

c. Have students construct a graph to show which types of transportation are better energy savers.

d. Have a discussion on how good driving habits can help save energy.

e. Encourage students to use school buses, municipal buses, bicycles, or their own two feet when coming to school.

f. Have students choose a means of transportation and imagine that his family had to use it to meet his transportation needs for one week. Have the students discuss how they would maintain their transportation choice, how fast they could go, and other problems or benefits.

Resources:

Pamphlets/Booklets

a. Energy and Transportation.

Periodicals

a. Science and Children. "Refuel Here for Energy Conservation Ideas", pp. 22-23, Vol 15, No. 6.

Others

a. "Your Energy World".

Third Grade

Concept 10

Oil is converted into gasoline, diesel fuel, and kerosene.

Activities:

a. Use activities from Energy and Transportation, National Science Teachers Association, Dec., 1977.

b. Use vocabulary list on p. 89 of above publication for spelling, games, and puzzles.

c. Use transportation study prints for individual oral reports.

d. Plan murals and dioramas concerning how gasoline, fuel (diesel) and kerosene must be conserved so that there will be enough for everyone.

e. Invite employees of fuel companies, service station attendants, and mechanics as speakers.

f. Ask students who participate in the Cub Scouts' Pinewood Derby to give oral reports (and bring cars they've built, if possible) to demonstrate power other than fuel used to make cars move at relatively high speeds.

g. Make lists of forms of transportation people would have to use if oil, gasoline, diesel fuel and kerosene would suddenly become obsolete.

h. Have children make lists of things for which oil is used. Then, show them charts obtained from Union Carbide containing 490 everyday items. Activities to accompany this chart on page 3, NSTA Teachers' Guide, Elementary Science Packet No. 12.

Resources:

Pamphlets/Booklets

a. Energy and Transportation.
b. The Mini-Page Activity Book.

Kindergarten thru Third Grade

Third Grade

Filmstrips

a. Oil.
b. Oil: A Finite Fuel.
c. Shell's Wonderful World of Oil.
d. Story of Petroleum.
e. The Fossil Story.
f. The Price of Progress.

Others

a. "New Frontiers for Energy".
b. Union-Carbide.

Third Grade

Concept 11

When fuels are burned they release energy which enables vehicles to function.

Activities:

a. Borrow a simple steam engine from a science department to demonstrate the concept.

b. Use songs from record "Energy and Motion Songs", especially "Engines" (side 1) and "Jets" (side 2) for listening, creative movement and stimulating further research.

c. Trace fuels (wood, petroleum, etc.) to their original sources.

Resources:

Books

a. Zim, Herbert S. What's Inside of Engines.

Records

a. "Energy and Motion Songs".

Kindergarten thru Third Grade

Third Grade

Concept 12

Vehicles used for transportation can pollute land, air, and water.

Activities:

a. Use materials and activities from the booklet Energy and Transportation, Grade 3. You may use activities found on page 79, "An Airplane in My Living Room", and the puzzle, "Give a Hoot! Don't Pollute!", on page 82.

b. Show filmstrips about pollution caused by vehicles. For example: Dash McTrash and the Boys.

c. Invite a car dealer to class to explain how car companies are trying to reduce pollution.

d. Have students collect articles on pollution from newspapers and magazines and share information with the class.

e. Have students identify the type of pollutants found at airports, bus terminals, etc.

f. Have students make anti-pollution posters and display these around the school.

Resources:

Pamphlets/Booklets

a. Energy and Transportation.

Filmstrips

a. Dash McTrash and the Boys.

Others

a. "Your Energy World".

Kindergarten thru Third Grade

Annotated Bibliography[1]

Books

Branley, Franklyn M. Solar Energy. New York:
Crowell Co.

This is a book of experiments that can be used by all grades.

Brennen, Matthew J. People and Their Environment.
Morristown, N.J.: Silver Burdett, 1972.

This book suggest ideas related to energy conservation in our schools and community.

Energy in the Classroom.

This resource guide, developed in Virginia, is an excellent source for classroom activities. Order from:

Kathy Baker Erickson
Virginia Energy Office
823 East Main Street
Richmond, Virginia 23219.

Federal Energy Administration. My Energy Book.
U.S. Government Printing Office, 1976.

This is an excellent children's book for grades K-3. Copies are available upon request from:

Department of Communications and Public Affairs
Federal Energy Administration
Washington, D.C.

Hooft, Gordon E. Van. How We Use and Control It.
New York City: Allyn and Bacon, 1974.

This book contains stories and experiments on energy conservation in the community.

Irving, Robert. Energy and Power. New York:
Alfred A. Knopf, 1959.

This is a resource book of classroom activities on energy conservation.

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[1] All available information on resources is included in each reference.

Kindergarten thru Third Grade

Lawson, Robert. Ben and Me. New York: Dell Publishing Co.
1973.

This book gives some background information on Benjamin Franklin's inventions.

Smith, Norman F. Energy and Environment. Austin, Texas:
Steck-Vaughn Co., 1974.

This book contains some good teacher resource material and is appropriate for third grade students. Included are illustrations and diagrams with simple text to explain how we obtain energy, what we use it for, and how our environment is affected by the use of energy.

Smith, Stephen M., editor. Energy-Environment Mini-Unit
Guide. Washington, D.C.: National Science Teachers
Association, 1975.

This is an excellent source for all grade levels. Basic energy concepts are emphasized throughout the book and are reinforced through worksheets and illustrations.

The Energy We Use. Washington, D.C. National Science
Teachers Association.

This book includes lesson plans with activities on all sources of energy. Copies are available from:

U.S. Department of Energy
Technical Information Office
P.O. Box 62
Oak Ridge, Tenn 37830.

Woodburn, John H. The Whole Earth Energy Crisis.
New York: G.P. Putnam's Sons, 1973.

This book contains good background information on energy sources and the supply of them.

Zim, Herbert S. What's Inside of Engines. New York:
Morrow and Company, 1953.

Diagrams and explanations about how an engine converts fuel into energy are presented in this volume.

Kindergarten thru Third Grade

Pamphlets/Booklets

A Better Place To Be. Euston, Carol. Washington, D.C.: U.S. Department of the Interior, 1976.

This is a guide to environmental learning in classrooms, geared to levels K-3. It includes solar energy activities.

Award Winning Energy Education Activities for Elementary and High School Teachers. Carey, Helen H., editor. Washington, D.C.: National Science Teachers Association, 1977.

This contains projects and activities developed by teachers for all grade levels. Pictures, materials needed, step-by-step directions, and suggestions for use in many area are included. Copies are available from:
Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830.

Community Workers and the Energy They Use - Grade 2. U.S. Department of Energy. Washington, D.C.: National Science Teachers Association, October, 1977.

This is a source of student/teacher materials for units on energy use by community workers.

Electric Safety: A to Zap (booklet).
Electric Safety: A to Zap (coloring book).
Charlotte, N.C.: Duke Power company.

These are booklets for primary level. Classroom quanities are availabe. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Energy Activities with Energy Ant. Washington, D.C.: Federal Energy Administration, May, 1975.

This pamphlet contains a short story for the children about energy and how to use it wisely. It also contains several activities about energy that the children would enjoy doing.

Kindergarten thru Third Grade

Energy Conservation, ECO-Tips No. 5.
Energy Alternative, ECO-Tips No. 7. Washington, D.C.:
Concern, Inc.

These pamphlets list some of the energy alternatives such as solar, thermal, wind, solar sea, and organic materials. Suggestions are given as to what citizens should do and what the government should do concerning alternative sources of energy. Order from:

Concern, Inc.
2233 Wisconsin Ave., N.W.
Washington, D.C. 20007.

Energy Consumption in North Carolina, 1975 and 1976. Raleigh: Research Branch Energy Division, Department of Commerce, 1977.

This booklet compares the amount of energy used in North Carolina with the amount of energy used in the rest of the U.S.

Energy and Transportation. Washington, D.C.: U.S. Department of Energy, December, 1977.

This pamphlet contains lesson plans and activities which may be duplicated. It is designed to help students develop a conscious appreciation of the variety of transportation modes, past and present, and to assist them in understanding some of the ways that modern transportation systems affect their world. Order from:

Technical Information Office
P.O. Box 62
Oak Ridge, TN 37830.

Energy - Why We Must Conserve It Now. Greensboro, N.C.: Duke Power Company, 1978.

Pupil booklets are available at a teacher's request.

Factsheets N.S.T.A.

These factsheets are about all types of energy plus lists of addresses where other information can be obtained. Order from:

Technical Information Center
P.O. Box 62
Oak Ridge, TN 37830.

Kindergarten thru Third Grade

Living With Energy. Dayton, Ohio: Standard Oil Company, 1978.

This is an activity guide for teachers and students. It includes stencils on energy conservation. It may be adapted to grades K-3. Order from:

Amoco Teaching Aids
P.O. Box 1400 K
Dayton, Ohio.

Saving Energy at Home-Environment. Gourley, Frank A. Jr. Raleigh: N.C. State Board of Education.

These are energy saving tips that could be adapted easily for grades K-3. It is an excellent resource for upper grade levels.

Schools Can Conserve, Too. Washington, D.C.: U.S. Department of Energy Office of Marketing and Education. February, 1978.

This pamphlet suggest things schools can do to conserve energy.

Sources, Resources, and Choices. Pleming, Marsha. Atlanta: The Office of Public Affairs, Channel 30.

This is a good background study of the different forms of energy. It gives the history of each form of energy with present and future uses. Several handouts are available for duplication. Order from:

The Office of Public Affairs
Channel 30
Atlanta, GA.

Strategies for Wise Use of Energy. Raleigh: N.C. Department of Public Instruction, Division of Science Education, 1974.

This booklet contains activities for use in the school and a check list for energy conservation in school buildings.

Teaching Alternative. Posthuma, Fredrick E., editor. Washington, D.C.: National Education Association, 1978.

This pamphlet is a useful resource for grades 1-12 on all forms of energy. Several units on energy are included.

Kindergarten thru Third Grade

The Mini-Page Activity Book. Raleigh: News and Observer.

This is a compilation of mini-page children's newspapers and deals with a variety of subjects, many of them related to energy conservation.

Valuing the Environment. Charlotte: Charlotte-Mecklenburg Schools.

This is a teacher's guide for energy conservation activities and resources K-6.

What Happens When You Turn On The Light? Reilly and Lee Books.

This booklet has many pictures and an easy to read text explaining the energy used in our light bulbs. It is suitable for grade 3.

Periodicals

De Dapper, Joyce. "380 Million, Billion, Billion Watt Light Bulbs". *Ranger Rick* (March, 1977).

This is a short article on a child's level, giving basic information about the sun in an appealing manner.

"Energy 8, Sun Power". *Intellectual Digest* 3:19-22 (July, 1973).

Garber, Nancy. "Energy from Inside the Earth". *Ranger Rick* (December, 1975).

This article is a good source of information on geothermal heat.

Glaser, Peter E. "Solar Energy-Prospects for Its Large-Scale Use". *Science Teacher* 39:36-39 (March, 1972).

Hamilton, Roger. "Can We Harness the Wind?" *National Geographic Society* (December, 1975).

This is an article with picture of past, present and future windmills and their uses.

Kindergarten thru Third Grade

Houck, Oliver A. "The Best Present of All". Ranger Rick (June, 1944).

This is a story on second grade reading level which tells about many forms of energy.

Science and Children (March, 1978).

This issue contains numerous articles and activities concerning energy conservation.

"Sun Power". National Geographic Society. (January, 1978).

This article contains pictures and drawings on a K-3 grade level plus an energy maze game.

Watkins, Rupert. "Solar Energy for Tobacco Curing". Progrssive Farmer (April, 1978).

Since Guilford County farmers grow tobacco, this is a very appropriate article.

Weaver, Kenneth. "The Power of Letting Off Steam". National Geographic Society (October, 1977).

This article tells how geothermal energy is being used now and the possible uses for the future.

Weaver, Kenneth. "The Search for Tomorrow's Power". National Geographic Society (November, 1972).

This article discusses the most available forms of energy and emphasizes our dependence on electricity.

Wilhelm, John. "Solar Energy: The Ultimate Powerhouse". National Geographic Society (March, 1976).

This article contains rather detailed information and drawings about solar heating and cooling systems.

"Wind Toys". Ranger Rick (June, 1977).

This article suggest wind-power models which students can make.

Young, Gordon. "Will Coal Be Tomorrow's Black Gold?" National Geographic Society (August, 1975).

This article contains excellent pictures plus a cross-section drawing of a coal mine. There is much specific information about coal.

Filmstrips

An Introduction to Plants. SVE (No. 407-SR).

Communities of Living Things. McGraw-Hill.

This set of 6 filmstrips explains in simple terms the interdependence of animals, plants and their environment.

Common Rocks and Rock Forming Minerals. SVE.

This filmstrip is especially helpful in units dealing with matter and changes (physical and chemical) which take place.

Conservation Filmstrips. Shell Oil Company.

These filmstrips are somewhat technical but seem appropriate for primary grades. For a list of films covering a variety of subjects that can be borrowed, contact:

Shell Oil Company
One Shell Plaza, Room 1541
Houston, Texas 77001.

Dash McTrash and the Boys. SVE.

A filmstrip which helps children to care about pollution. Available from:

SVE
1345 Diversey Parkway
Chicago, Illinois 60614.

Kindergarten thru Third Grade

Energy and You. SVE (color, records and/or cassettes, teacher'guide).

"Big E" and his friend, Lucinda, explore many aspects of energy with such topics as, "What is it?", "Where does it go?", and "How do you store it?".

Energy Does Work. Coronet.

This filmstrip features a boy who learns that he is doing work when he plays. It explains how work is done, that work takes energy, and that energy can be stored.

Energy Flow in a Community. SVE (No. 426-6).

This filmstrip helps children realize that plants and animals that live together need each other to survive.

Energy, Force, and Motion. SVE. (No. 451-4).

This filmstrip shows how energy is used to do work.

The Environment. Department of Public Instruction. (rental fee).

This is a brief introduction to the study of energy as it relates to the central issues of man's relationship with the world in which he lives.

Exploring Matter and Energy. SVE. (No. 451-SATC).

This filmstrip explores the basic principles of matter and the effects of energy on matter.

Finding Out About Heating Solids, Liquids and Gases. SVE. (No. 424-16).

This filmstrip shows the relationship between energy and the states of matter.

Kindergarten thru Third Grade

Finding Out About Simple Machines. SVE. (No. 424-14).

This filmstrip explores with the children the basic simple machines such as the lever, pulley, and wedge.

Finding Out About The Solar System. SVE. (No. 424-17).

This filmstrip explains in very simple terms about the solar system. It is part of a basic science series.

Forms of Energy SVE. (No. 451-6).

This filmstrip helps children to become aware of the kinds of energy ahd how energy interacts with matter.

The Fossil Story. Shell Oil Company.

How Plants Make Food. SVE. (No. 471-2).

Land Forms of Running Water. SVE.

This filmstrip is helpful in units dealing with matter and the conservation of our waste resources.

Matter and Molecules. SVE. (records, and/or tapes).

This filmstrip is useful in units dealing with the more technical aspects (on primary level) of matter.

More Science Experiments. SVE. (No. 436-3).

This filmstrip demonstrates some simple do-it-yourself experiments using ordinary objects. It helps to explain light, work, inertia, water, and ice.

Oil. Shell Oil Company.

Kindergarten thru Third Grade

Oil: A Finite Fuel. SVE. (No. C462-2).

Parts of this filmstrip are suitable for third graders.

Our Minerals and Energy Resources. Coronet.

This filmstrip is appropriate for relating minerals and energy sources in grades K-3. Order from:
Dow Chemical Co., A.V. Department
2030 Building
Midland, Mich., 48640.

The Price of Progress. SVE. (No. C462-1).

Seasons. SVE. (No. 435-12).

Seed Magic: Life Story of a Bean. SVE. (No. 471-3).

Shell's Wonderful World of Oil. Shell Oil Company.

Solar System - Family of Planets. SVE. (No. 461-4).

In this filmstrip, children visit an observatory where they learn about the solar system and look at each planet.

Solids, Liquids, and Gases. SVE. (No. 451-2).

This film strip shows the relationship between energy and various states of matter.

Story in the Rocks. Shell Oil Company

This filmstrip is somewhat technical, but it seems appropriate for primary grades. Availabe from:
Shell Oil Company
One Shell Plaza, Room 1541
Houston, Texas 77001.

Kindergarten thru Third Grade

Story of Petroleum. Shell Oil Company.

Sun: Keeping the Earth Warm. SVE. (No. 461-2).

This filmstrip describes solar energy.

Toys at Work. SVE. (No. 436-5).

This filmstrip shows children the principles of energy using simple toys.

Films

Electric Safety: A to Zap. Duke Power Company.

This film is designed to introduce primary students to electricity and its hazards. Order from:
Educational Services
Duke Power Company
P.O. Box 2178
Charlotte, N.C. 28242.

Records

Burstein, John. "Slim Goodbody Presents The Inside Story". Teacher, 1977.

This is a record for grades K-3. Songs teach the basic concepts involving the human body's systems, circulatory, digestive, skeletal and muscular.

"Dance-A-Story About Balloons".

This record is used when experimenting and creating a dance about wind and air. Order from:
Record Center
2581 Piedmont Road, N.E.
Atlanta, Georgia 30324.

Glazer, Tom. "Energy and Motion Songs". Motivation Records.

This record has songs which describe each kind of energy. Lyrics are included. It is suitable for all ages.

Palmer, Hap. "Getting to Know Myself", "All About Me", "Learning Basic Skills Through Music", Volumes 1 and 2. Freeport, N. Y.:

These record are excellent source of creative experiences for exploring personal energy. Order from:

Educational Activities, Inc.
530 Riverview Ave.
Elkhart, Indiana 46514.

Others

"Ecology and Energy Action Pack."

This pack contains activity masters and a transparency pertaining to energy awareness. It may be obtained from:

McDonald's Corporation
One McDonald Plaza
Oak Brook, Ill. 60521.

"New Frontiers for Energy."

This packet contains articles and ideas concerning oil, natural gas, and coal. Order from:

American Petroleum Institute
1801 K. Street, N.W.
Washington, D.C. 20006.

Packet, charts, and materials related to oil may be ordered from:

Union-Carbide, Public Affairs
1730 Penn. Ave., N.W.
Washington, D.C. 20006.

Packets of "Science Activities in Energy", covering Conservation, Solar Energy, Chemical Energy and Electricial Energy may be ordered from:

American Museum of Atomic Energy
Oak Ridge Association Universiies
P.O. Box 117
Oak Ridge, Tenn. 37830.
(One set of these has been placed in each school).

Packets of four activity units, "Your Energy World", may be ordered from:

U.S. Department of Energy
Office of Marketing and Energy
Washington, D.C. 20545.
(One set of these has been placed in each school).

Fourth Grade thru Sixth Grade[1]

Joseph Everett	Jan Weisner
Judy Jessie	Katherine Wishart
Donese Knight	Judy Wray
Janie Schwab	Mary Wray
Ellen Watts	

Introduction

This section of the Guide was developed to parallel the study of North Carolina, the United States, and the World in grades four, five and six respectively. The suggested grade level activities may be used for science, math, creative writing, art, reading, etc.

The use of the Guide should help to make each student aware of the need for energy conservation. With enhanced awareness, it is anticipated that each student will assume the responsibility for making personal efforts to conserve energy.

> I am only one,
> But still I am one.
> I cannot do everything,
> But still I can do something.
> And because I cannot do everything,
> I will not refuse to do the something
> that I can do.
> Edward Everett Hale (1822-1909)

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[1] Representatives from grades 4-6 participated in the development of this section of the Guide. School representatives identified possible resources in spring, 1978, and the individuals listed above developed the concepts and activities in this section and matched resources to them.

FOURTH GRADE THRU SIXTH GRADE

List of Concepts

Fourth Grade:

1. The people of N.C. have many natural resources which have been used for energy sources in the past and are being used in the present.
2. The people of North Carolina must develop ways of of conserving our energy resources of today.
3. The people of North Carolina must develop alternative forms of energy for future use.
4. Each of us needs to change our habits of energy use and make value judgments which can affect the quality of life.

Fifth Grade:

1. Important sources of energy are found in sedimentary formations.
2. Energy resources that cannot be replaced should be carefully conserved.
3. Limited energy resources can alter the life style of a nation.
4. Our nation needs to develop an awareness of the importance of energy conservation.

Sixth Grade:

1. Many changes made by man in his environment to provide energy are not necessary to fill his basic needs and only serve to fulfill his desires.
2. Man's inventive genius has produced many machines that consume enormous amounts of our energy resourses.
3. Man should develop personal and group behaviors that will contribute to an improved environment through the use of energy conservation.
4. Man should cooperate on a world-wide basis for the provision of basic energy needs.

Fourth Grade thru Sixth Grade

Fourth Grade

Concept 1

The people of North Carolina have many natural resources which have been used for energy sources in the past and are being used in the present.

Activities

a. Introduce the concept by defining terms which apply to this unit of study. Examples: resources - natural and man-made.

b. Make a chart using comparisons of the past and present energy resources.

c. Let children compare older methods of energy used with newer methods. Examples: have students compare the time required to make a candle and the time required to switch on an electric light.

d. Use old and new "gadget" pictures to make a collage.

e. Interview an older person or invite an older person to class to discuss the uses of energy in previous days.

f. Take a field trip. Examples: Old Salem, Natural Science Center (See Appendix A: Field Trip Possibilities for information on sites).

g. Collect and display old and new "gadgets". Examples: flat iron and electric iron.

Resources

Books

a. Energy: Its Past, Its Present, Its Future.
b. Man's Mark on Land.
c. The People of North Carolina. pp. 92-138 (basal text)[1]

Films

a. Treasures of the Earth.

Others

a. "Your Energy World".

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[1] Basal texts are not included in the Annotated Bibliography.

Fourth Grade thru Sixth Grade

Fourth Grade

Concept 2

The people of North Carolina must develop ways of conserving our energy resources of today.

Activities

a. Introduce appropriate terms and define them.

b. Use the activity kit, "Your Energy World".

c. Use the *Energy Awareness Card Game*.

d. Have resource people come to the classroom. Examples: Joe Howard, Duke Power; Capt. A.B. Kimel, Greensboro Fireman.

e. Have students check home and school for inefficient uses of energy (See *Science Activities in Energy*).

Resources

Books

a. *Disappearing Energy; Can We End the Crisis?*
b. *Elementary School Science*. pp. 246-279 (basal text).
c. *Going, Going, Gone*.
d. *Only Earth We Have*.

Pamphlets/Booklets

a. *Conserve: It's Worth Your Energy*.
b. *65 Ways to Save Natural Gas*.

Games

a. *Energy Awareness Card Game*.

Others

a. "Ecology and Energy Action People."
b. "Science Activities in Energy".
c. "Your Energy World."

Fourth Grade thru Sixth Grade

Fourth Grade

Concept 3

The people of North Carolina must develop alternative forms of energy for future use.

Activities

a. Write descriptions or draw pictures of homes and cars of the future.

b. Conduct demonstrations and experiments using alternative forms of energy. Examples: solar hot dog cooker, simple solar hot water heater (See Science Activities in Energy).

c. Discuss some future possibilities of energy emphasizing practicality. Examples: solar, winds, oceans, and geothermal.

d. Use color slides and tapes, Solar Energy: Ready When You Are!

Resources

Books

a. Disappearing Energy; Can We End the Crisis.
b. Elementary School Science. pp. 263-271 (basal text).
c. Energy: Its Past, Its Present, Its Future.
d. Going, Going, Gone.

Pamphlets/Booklets

a. Conserve: It's Worth Your Energy.

Films

a. Energy Crisis.

Slides

a. Solar Energy: Ready When Your Are!

Others

a. "Science Activities in Energy."

Fourth Grade

Concept 4

Each of us needs to change our habits of energy use and make value judgment which can affect the quality of life.

Activities

a. Have resource person from Home Building Association visit and discuss ways students can observe energy at home.

b. Write and produce skits comparing "DO's" and "DON'Ts" in energy conservation.

c. Make posters showing "DO's" and "DON'Ts" in conserving energy.

d. Play Crisis game.

e. Have a discussion of ways to conserve energy.

f. Make a list of ways to conserve energy in the home and the school and how to implement them.

g. Compare the amount of electricity used by your family in one day or one week by reading the meter. Compare findings with those of other students.

h. Make a bulletin board using pictures to classify different uses of energy. Identify which ones affect our lives the most and the least. Examples: appliances, transportation.

Resources

Pamphlets/Booklets

a. Conserve: It's Worth Your Energy.
b. Elementary School Science. pp. 272-277 (basal text).[1]
c. Fun With the Environment.

Games

a. Crisis Game.

Others

a. "Science Activities in Energy."

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[1] Basal texts are not included in the Annotated Bibliography.

Fifth Grade

Concept 1

Important sources of energy are found in sedimentary formations.

Activities

a. Discuss with pupils some of the concepts related to the formation of coal, oil, and natural gas.

b. Form committees of students to do research on types of fuel and their formation.

c. Have students write reports on the formation of one type of fuel using information gathered through research in item b.

d. Make posters and/or bulletin boards illustrating the concept listed above.

Resources

Books

a. Elementary School Science. pp. 175-179 (basal text).[1]
b. Modern Science. pp. 108-110 (basal text).
c. Petroleum, Oil, Gas, and Asphalt.
d. The First Oil Rush.

Pamphlets/Booklets

a. The Energy Challenge.

Filmstrips

a. Energy - A Study of Resources.

Films

a. Treasures of the Earth.

Others

a. "The Energy Crisis: What You Can Do About It."

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[1] Basal texts are not included in the Annotated Bibliography.

Fifth Grade

Concept 2

Energy resources that cannot be replaced should be carefully conserved.

Activities

a. Play conservation game.
Materials: bucket, small cups - one per child, water or fruit juice
Give each pupil a cup. Fill the bucket with water or juice. Have each pupil fill his cup with the liquid noticing how quickly the amount is being depleted. Have students explain the reduction and apply the explanation to the conservation of energy resources. Have pupils suggest ways to conserve the water or juice. Then have each pupil take out less liquid (½ cup or ¼ cup). This activity will show that conservation will increase the amount of time our resources will be available.

b. Show filmstrip "Oil, A Finite Fuel" from filmstrip kit Energy - A Study of Resources.

c. Use sheet #17 and #18 from The Energy Challenge.

d. Read and discuss the comic book, Energy: Why We Must Conserve It Now?

e. Use activity masters #5 and #6 from Your Energy World, Unit One.

f. Use a large map of the U.S. and show the locations of energy resources - oil, coal, steam, gas (natural), and major dams (hydroelectric).

Resources

Pamphlets/Booklets

a. Energy: Why We Must Conserve It Now?
b. The Energy Challenge.

Filmstrips

a. Energy - A Study of Resources.

Others

a. "Your Energy World."

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Fourth Grade thru Sixth Grade

Fifth Grade

Concept 3

Limited energy resources can alter the life style of a nation.

Activities

a. Show the film - Have We Stayed Too Long At The Fair?

b. Discuss ways, as shown in the film, that the American life style has been altered.

c. List additional ways in which our life style could change as a result of a similar situation.

d. Initiate a game limiting student resources, such as paper, to see how they would react to a limited resource situation.

e. Assign a paper to be written on a given topic such as:
   1. The day we ran out of gas.
   2. How would my family use ten gallons of gasoline, if we were limited to that amount for a month.
   3. If Duke Power decreed that each family could use only 3 electrical appliances, which ones would I use and why?

f. Play Crisis Game.

Resources

Flims

a. Have We Stayed Too Long At The Fair?

Games

a. Crisis Game.

Fifth Grade

Concept 4

Our nation needs to develop an awareness of the importance of energy conservation.

Activities

a. Write letters to governmental agencies asking for materials that tell what our nation is doing to conserve energy.

b. Display materials obtained through the letter writing excercise.

c. Using these materials to discuss various methods of energy conservation.

d. Have pupils read their electrical meters prior to a Monday's class. Reread the meter one week later. Then have pupils use energy conservation techniques for the successive week. Reread meter and compare kilowatt hours used during each week.

e. Pupils should survey streets adjacent to school campus and observe number of large cars, small ones, cars with one occupant, etc. Use activity master 2, Unit Two of "Your Energy World."

f. Using the statements on master 2, Unit Three, of "Your Energy World," organize a game for the students which requires them to respond to each statement with "waste" or "save."

Resources

Pamphlets/Booklets

a. Energy: Why We Must Conserve It Now?

Others

a. "Your Energy World."

Fourth Grade thru Sixth Grade

Sixth Grade

Concept 1

Many changes made by man in his environment to provide energy are not necessary to fill his basic needs and only serve to fulfill his desires.

Activities

a. Make a comparative list of needs and desires.

b. Prepare a display of what life would be like, if energy were availabe only for our basic needs.

c. Prepare a simulation of survival techniques.

d. Read orally exerpts from books concerning survival.

e. Play *Crisis Game*.

f. Have students survey homes to determine number of energy-guzzling devices (cars, boats, televisions, air conditioners, clothes dryers, etc.) being used to fulfill desires rather than needs.

Resources

Books

a. *Disappearing Energy: Can We End the Crisis?*
b. *Elementary School Science*. pp. 302-311 (basal text).[1]
c. *Going, Going, Gone*.
d. *Only Earth We Have*.
e. *People and Change*. Grade 6. pp. 86-97 (basal text).

Games

a. *Crisis Game*.

Others

a. "Your Energy World."

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[1] Basal texts are not included in the Annotated Bibliography.

Sixth Grade

Concept 2

Man's inventive genius has produced many machines that consume enormous amounts of our energy resources.

Activities

a. Group discussion on how machines have made our world better or worse.

b. Have a debate on how machines have made our world better or worse.

c. Plan a puppet show about machines to present to younger children.

d. Read books about machines and inventors.

e. Have each child choose a sport or recreational activity. Next, have students write reports discussing the pros and cons of energy conservation within that sport.

Resources

Books

a. Elementary School Science. pp. 302-311 (basal text).[1]
b. Exploring Our World: Eastern Hemisphere. pp. 216-223 (basal text).
c. People and Change. pp. 86-97 (basal text).
d. The Old World. pp. 307-310 (basal text).

Pamphlets/Booklets

a. A Handbook for the Serious (and Not So Serious) Energy Saver.
b. Citizen's Workshops on Energy and the Environment Handbook.

Filmstrips

a. Energy - A Study of Resources.

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[1] Basal texts are not included in the Annotated Bibliography.

Sixth Grade

Concept 3

Man should develop personal and group behaviors that will contribute to an improved environment through the uses of energy conservation.

Activities

a. Appoint an "energy captain" who assumes responsibility for energy conservation measures in the classroom.

b. Do junk art (without the aid of power tools that use energy) in the form of collages, mosaics, sculptures, decorations, mobiles, etc. using objects of junk. Use your imagination!

c. Organize an Energy Conservation Week for the entire school. Include demonstrations, experiments, contest, etc.

d. Set up collection centers for items to be recycled or make posters to inform students where these centers are already stationed.

Resources

Books

a. Basic Health Science. Level F. pp. 246-247 (basal text).[1]
b. Elementary School Science. pp. 302-311 (basal text).
c. Health and Growth. pp. 76-86. (basal text).
d. People and Change. pp. 86-97 (basal text).

Pamphlets/Booklets

a. Conserve: It's Worth Your Energy.
b. The Energy Challenge. activity 17.
c. Tips for Energy Savers.

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[1] Basal texts are not included in the Annotated Bibliography.

Sixth Grade

Concept 4

Man should cooperate on a world-wide basis for the provision of basic energy needs.

Activities

a. Do research to determine the percentage of the world's energy used by the U.S. and produced by the U.S. Make graphs showing these results.

b. Do comparative research and report on energy used per person in different countries. For example, the world average for oil usage is 200 gallons per person as compared to 1100 gallons per person in the U.S.

c. Make a scrapebook or bulletin board of newspaper articles concerning international use of energy.

d. Draw political cartoons on the energy crisis.

e. Bring in the Energy Environment Simulator game for the use in the classroom.

Resources

Books

a. Elementary School Science. pp. 302-311 (basal text).[1]
b. Energy for the 21st Century.
c. Energy: Power for People.
d. People and Changes. pp. 86-97 (basal text).

Pamphlets/Booklets

a. Our Spaceship Earth Needs More Fuel.
b. The Energy Challenge. activities 18, 21, 22.

Filmstrips

a. Energy - A Study of Resources.

Films

a. Energy Crisis.
b. The Search for New Energy. Part 1

Games

a. Energy - Environment Simulator.

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[1] Basal texts are not included in the Annotated Bibliography.

Fourth Grade thru Sixth Grade

Annotated Bibliography[1]

Books

Adler, Irving. Petroleum, Gas, Oil, and Asphalt. Day, 1975.

In this reference, petroleum is examined from its development to the processing of it for commercial purposes with emphasis on the need to conserve it.

Archer, Sellers G. Rain, Rivers and Reservoirs: The Challenge of Running Water. Coward-McCann, 1963.

This reference discusses the importance of water conservation.

Branley, Franklyn M. Energy for the 21st Century. Crowell, 1975.

This reference covers the history of energy and future methods of producing power using photosynthesis, solar, geothermal, wind, and tidal energy.

Conn, Frances G. The First Oil Rush. Meredith Press, 1967.

This reference examines the discovery of oil in Pennsylvania and the results of the discovery.

Gregor, Arthur S. Man's Mark on the Land. Scribner, 1974.

This reference discusses the effect man has had on his environment from the stone age to the present.

Gutnik, Martin J. Energy: Its Past, Its Present, and Its Future. Childrens Press, 1975.

In this reference, the origins of energy, the forms of energy, and some future alternatives of energy are presented.

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[1] All available information on resources is included in each reference.

Fourth Grade thru Sixth Grade

Hoke, John. Solar Energy. Watts, 1968.

This reference is designed for mature sixth grade readers. Solar energy is presented using projects that can be done at home or school with simple materials.

Marshall, James. Going, Going, Gone. New York: Coward, McCann, and Geoghegan, Inc. 1976.

This reference examines the present energy crisis and suggest possible solutions for the future.

Pringle, Lawrence. Energy: Power for People. Macmillan, 1975.

This reference examines the energy crisis and the various potential energy sources.

Pringle, Lawrence. Only Earth We Have. Collier-Macmillan, 1969.

In this reference, emphasis is given to air and water pollution and what can be done to preserve the earth's natural resources.

Shuttlesworth, Dorothy E. Disappearing Energy; Can We End The Crisis? Doubleday, 1974.

This reference discusses the developing energy shortage and ways to avert such shortages.

Pamphlets/Booklets

A Handbook for the Serious (and Not So Serious) Energy Saver. Charlotte: Duke Power Company.

This pamphlet presents over one hundred ways to save on energy consumption in the home. It is a good resource for sixth grade and above. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Fourth Grade thru Sixth Grade

Award Winning Energy Education Activities.

This pamphlet consists of experiments, activities, and art ideas prepared by students for all grade levels. Order from:

National Science Teachers Association
1742 Conneticut Ave., N.W.
Washington, D.C. 20009.

Citizen's Workshop on Energy and the Environment Handbook. Washington. 1978.

This 32 page booklet contains comprehensive historical information about energy and the current energy situation. It is recommended for sixth grade and above. Order from:

Office of Public Affairs
U.S. Department of Energy
Washington, D.C. 20585.

Conserve: It's Worth Your Energy. Greensboro, N.C.

This booklet gives advice on building homes, including tips on insulation, meter reading, and other savers. Order from:

City of Greensboro
The Greensboro Energy Conservation Commission
Greensboro, N.C.

Electricity and Our Energy Future.

This booklet, in comic format, discusses energy usage, services provided, and research needed to meet our future needs. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Electric Safety: A to Zap.

This booklet, in comic format, is a coloring book with safety facts about electricity. It is recommended for fourth graders. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Fourth Grade thru Sixth Grade

Energy: Why We Must Conserve It Now.

This booklet, in comic format, is for advanced fifth and sixth grade students and illustrates the need for conserving energy. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701

Fun With the Environment. Washington, D.C.: U.S. Environmental Protection Agency.

This pamphlet has an appealing cartoon format and deals with environmental and conservational problems.

Networks: How Energy Links People, Goods and Services. Washington, D.C.: N.S.T.A., February, 1978.

This is a booklet with a step-by-step unit development to investigate a simple energy network and compare it to networks in the natural and man-made worlds. It is recommended for sixth and seventh grade students.

Our Spaceship Earth Need More Fuel.

This booklet, in comic format, examines the energy crisis and ways we can conserve energy. It is geared toward advanced fifth and sixth grade students. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Plants, Animals, and Man Sharing the Earth: An Ecology Story. Ankeny, Iowa: Soil Conservation Society of America.

This booklet, in comic format, presents discussions of many aspects of ecology. Order from:

Guilford County Soil Conservation District.

Fourth Grade thru Sixth Grade

Save Energy with Textiles. Charlotte: American Textile Manufacturers Institute.

This is a consumer handbook on ways that people can save energy in the home. Order from:
American Textile Manufacturers Institute
400 South Tryon Street
Charlotte, N.C. 28285.

65 Ways to Save Nutural Gas. Washington, D.C.: U.S. Department of Energy.

This pamphlet suggest ways to conserve natural gas. The ideas may be applied to other energy forms.

The Atom, Electricity and You! Duke Power Company.

This booklet, presented in comic book format, covers factual information on nuclear energy and on nuclear stations. It is designed for advanced fifth and sixth grade students.

The Energy Challenge. Washington, D.C.: Federal Energy Administration.

This booklet is a comprehensive series of 22 spirited duplicating masters designed for grades 5-8. Order from:
Energy Challenge
Box 14306
Dayton, Ohio 45414.

The Energy Conserver. Raleigh: N.C. Department of Public Instruction.

This is a monthly newsletter featuring energy facts and reporting on what various school and civic groups are doing concerning energy.

The Story of Electricity.

This booklet, in comic format, explains the operation of electric power plants. It is designed for advanced fifth and sixth grade students. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Fourth Grade thru Sixth Grade

Tips for Energy Savers. Pueblo, Colorado: Federal Energy Administration, August 1977.

This is a readable list of tips for use at home, on the road, and in the market place. It is appropriate for grades five and six.

Where The Little Light Bulb Gets Its Juice.

This booklet, in comic format, provides a discussion of how power is produced. It is appropriate for fourth grade students. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Games

Canipe, Stephen L. Crisis Game.

This is a board game involving problems of energy conservation. Directions and necessary materials are included. It is appropriate for grades 4-6. Order from:
N.C. Department of Public Instruction
Raleigh, N.C. 27611.

D'Arruda, Jose. Energy-Environment Simulator.

Using an analog computer which simulates the world, students can manipulate energy resources and realize the effect of various decisions as time passes at a rate of 100 years a minute. The game is suitable for sixth grade students. Order from:
Dr. Jose D'Arruda
Pembroke State University
Pembroke, N.C. 27264.

N.C. Department of Public Instruction. Energy Awareness Card Game.

This card games focuses on energy-saving ideas. Directions and materials are included. Order from:
Division of Science Education
N.C.D.P.I.
Raleigh, N.C. 27611.

Fourth Grade thru Sixth Grade

Filmstrips

Energy-A Study of Resources. QED Productions. (color, sound-tapes, teacher's guide).

There are six filmstrips included in this set. Order from:
QED Publications
P.O. Box 1608
Burbank, California 91507.

Films

Energy Crisis. No. 75-44 (color, 16 mm, 13 min.)

This film reviews the different energy sources and predicts the length of time we may be able to depend on them. Order from:
Office of Library/Media Services
Guilford County School System.

Have We Stayed Too Long At The Fair? (color, 16 mm, 27 min.)

This film reviews problems during the energy crisis of the winter of 1977 and stresses the need for action on energy problems. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

The Search for New Energy. No. S-19. (color, 16 mm, 15 min.)

This film has an appealing presentation covering several short-term alternatives for new energy. Order from:
Office of Library/Media Services
Guilford County School System

Treasures of the Earth. No. 64-93. (16 mm, 11 min.)

This film examines forces within the earth's crust which effect the location and extent of natural resources. In particular, the concentration of minerals and the formation of oil and coal are discussed. Order from:
Office of Library/Media Services
Guilford County School System

Fourth Grade thru Sixth Grade

Slides

Solar Energy: Ready When You Are! Federal Energy Administration. (color, cassette, 16 min.)

The potential uses of solar energy in contemporary residential and commercial buildings are explored. Order from:

Environmental Education Recreation
and Research Center
Route 1, Box 401
High Point, N.C. 27260.

Others

"Ecology and Energy Action Pack." 1973.

This kit for grades 4 and 5 contains five spirit duplicating masters and unit studies designed for teacher use. It emphasizes individual student responsibility for conservation. Order from:

McDonald's Corporation
One McDonald's Plaza
Oak Brook, Illinois 60521.

"Science Activities in Energy."

This is a kit of useful hands-on activities for student use in grades 4-6. Order from:

American Museum of Atomic Energy
Oak Ridge Associated Universities
P.O. Box 117
Oak Ridge, Tenn. 37830.

"The Energy Crisis."

This is a kit containing brief lesson plans, a pre-and-post test, audio-visual aid suggestions, and material sources concerning the energy crisis. It is on a sixth grade level. Order from:

Lee County Environmental Education Program
Title III E.S.E.A.
2266 Second Street
Fort Myers, Florida.

Fourth Grade thru Sixth Grade

"The Energy Crisis; What You Can Do About It."
Standard Oil Company.

This is a set of four spirit duplicating masters that relate to the energy problem in today's world. Order from:

Amoco Teaching Aids
P.O. Box 1400 K
Dayton, Ohio 45414.

"Your Energy World."

This is a packet of materials divided into four units containing posters and spirit duplicating masters for activity sheets. Order from:

Technical Information Center
P.O. Box 62
Oak Ridge, Tenn. 37830.

Seventh Grade thru Ninth Grade[1]

John Bingaman	Grace Puckett
Bill Burchfield	Vernice Shanks
Sheryl Clowers	Pam Sides
Virginia Henry	Bill Williams
Lynn Johnson	Pamela Mitchell

Introduction

Energy Conservation is a vital issue in our lives today. It is necessary that teachers create an awareness of energy issues and help foster attitudes which will make energy conservation an integral part of our lives.

Teachers representing various subject areas prepared this section of the Guide with the goal of presenting concepts and ideas that will interrelate all disciplines and energy conservation. For example, language arts teachers can create an awareness of energy conservation needs; social studies teachers can offer an historical perspective of the development of energy; and in science, students can study the purely scientific aspect of energy conservation. Practical application can be studied in math, physical education, home economics, art, music and business. Teachers of exceptional children may refer to the various disciplines of activities and ideas on energy conservation.

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[1] Representatives from grades 7-9 participated in the development of this section of the Guide. School representatives identified possible resources in spring, 1978, and the individuals listed above developed the concepts and activities in this section and matched resources to them.

Seventh Grade thru Ninth Grade

List of Concepts

1. The study of the formation of energy sources is important to our understanding of today's energy crisis.
2. The earth has a variety of natural resources which have aided in the development of this country.
3. Our use and abuse of energy have led to various economic, social, environmental, and political issues.
4. Practical application of energy conservation must be practiced.
5. Technology has led to machinery designed to utilize energy.

Seventh Grade thru Ninth Grade

Concept 1

The study of the formation of energy sources is important to our understanding of today's energy crisis.

Language Arts

Activities:

a. Introduce students to different versions of formations of energy sources in literature by reading or telling the myth "Prometheus Steals Fire From Heaven" (Angene, el al. Myths, Fables and Legends). Folklore and science fiction can also be used. After some discussion, have students write their own version of or a myth about the formation of one source of energy.

b. Have students select and research one of the fossil fuels. All types of references can be used here including the slide set "The Energy Crisis" from Educational Design Inc., which is an excellent source on the formation of fossil fuels.

c. Have students illustrate the formation of energy sources by drawing sequential pictures, designing mobiles, making shadow boxes, and/or making charts and graphs.

d. Use "Seek and Find" puzzles. Let students think of all the words they know that relate to fossil fuels, their development and their uses. Then, have students make their own puzzles and exchange with each other.

Resources:

Books

a. Angene, et al. Myths, Fables & Legends.
b. Reading-Science-Math Drive-In Conference.

Films

a. The Great Search.

Slides

a. The Energy Crisis.

Seventh Grade thru Ninth Grade

Social Studies

Activities:

a. Have students discuss Mid-East fuel oil situation.

b. Have students do projects which display different types of building materials.

c. Have the students do book reports on coal, oil, fossil fuels, and other sources of energy.

d. Assign the construction of maps showing world-wide distribution of oil.

Resources:

Books

a. *Citizen's Workshop on Energy and the Environment Handbook.*
b. *The Energy Challenge.*

Filmstrips

a. *Man's Search for Energy.*

Films

a. *Energy, Ability To Do Work.*
b. *Oil.*

Slides

a. *The Energy Crisis.*

Seventh Grade thru Ninth Grade

Science

Activities:

a. Have the students complete worksheets dealing with energy from The Energy Challenge.

b. View and discuss filmstrips and films on energy with the students.

c. Have students discuss how fossil fuels were developed originally and do research work on the location of energy reserves throughout the world.

d. Using maps and globes, locate energy reserves throughout the world.

e. Have students utilize or construct models of rock layers to demonstrate the formation of energy resources.

f. Read and discuss pamphlets dealing with energy.

Resources:

Books

a. Citizen's Workshop on Energy and the Environment Handbook.
b. The Energy Challenge.

Filmstrips

a. Man's Search for Energy.

Films

a. Energy, Ability To Do Work.
b. Oil.

Slides

a. The Energy Crisis.

Concept 2

The earth has a variety of natural resources which have aided in the development of this country.

Language Arts

Activities:

a. Using maps and globes, have students identify the location of natural resources in the United States and the world.

b. Have students make charts and graphs showing the relationship of natural resources and the development of our country. This will require research using various library references.

c. Have students view films for class discussions on how we use our natural resources. Panel discussions can be used also.

d. Take students on a field trip (See Appendix A: Field Trip Possibilities for information).

e. Use resource people to discuss subjects from practical prospectives (See Appendix A).

Resources:

Books

a. Energy: Why We Must Conserve Now.

Filmstrips

a. America Runs on Electricity (The Energy Crisis).
b. Conserving Our Natural Resources.

Films

a. Seeking and Conserving Mineral Resources.

Seventh Grade thru Ninth Grade

Social Studies

Activities:

a. Take students on a field trip to appropriate locations (See Appendix A: Field Trip Possibilities for information).

b. Have students study maps for plotting natural resource distributions using The Energy Challenge, pages 5, 15, 18, and 21.

c. Have students find energy related stories in newspapers and magazines.

d. Have students make graphs showing relative amounts of energy derived from various sources.

e. View filmstrips "Community Energy Sources", Planning the Human Community.

f. Aid students in map reading skills dealing with location of energy, transportation cost, and measuring distances. using The Energy Challenge, pages 3, 4, 7, 17, and 22.

Resources:

Books

a. Energy-Environment Mini-Unit Guide.
b. The Energy Challenge.

Filmstrips

a. Planning the Human Community.

Seventh Grade thru Ninth Grade

Science

Activities:

a. Have the students complete worksheets from The Energy Challenge and Energy-Environment Mini-Unit Guide.

b. Have the students view and discuss films and filmstrips on natural resources.

c. Have the students construct models of generating facilities (e.g., steam, nuclear).

d. Have students construct a power transformer.

e. Arrange to participate in field trips.

f. Ask students to investigate forms of energy.

g. Produce charts illustrating the development of a given source of power and its delivery to the consumer.

h. Have the students draw maps showing the sources of fossil fuels.

i. List and discuss several of the largest industrial uses of electricity.

j. Have the students describe the limitations and advantages of the major sources of energy.

k. Read and discuss the comic book, Mickey Mouse and Goofy Explore Energy, and other pamphlets on energy and natural resources.

l. View slide presentations on wood as an alternate energy source.

m. Read and discuss magazine articles.

n. Have the students collect and present current events on energy.

o. Have the students read and discuss Nuclear Power and the Environment: Questions and Answers.

Seventh Grade thru Ninth Grade

Resources:

Books

a. *Energy-Environment Mini-Unit Guide*.
b. *Nuclear Power and the Environment: Questions and Answers*.
c. *The Energy Challenge*.

Pamphlets/Booklets

a. *All About Energy*.
b. *Energy and Education*.
c. *Environmental Educational Strategies for Wise Use of Energy*. pp. 48-55.
d. *Newspaper*.

Films

a. *The Search for New Energy*. Parts I & II.

Slides

a. *Wood as an Alternative Fuel Source*.

Others

a. "Conservation."
b. "Science in Search for Oil."
c. *The Wide World of Energy Multimedia Kit*. "Mickey Mouse and Goofy."

Seventh Grade thru Ninth Grade

Concept 3

Our use and abuse of energy has led to various economic, social, environmental, and political issues.

Language Arts

Activities:

a. Let students conduct a community survey to gather local views on the economic, social, environmental and political issues dealing with energy. Students can write their own survey questionaire. All results can be compiled into one report.

b. Debate the pros and cons of nuclear energy. Other energy or environmental issues could also be used for debates.

c. Arrange bulletin boards from newspaper and magazine articles brought in by students. Have students make brief oral reports on their contributions to this project.

d. View films and have students take notes and prepare for panel discussions.

Resources:

Pamphlets/Booklets

a. *Let's Stop Tilting at Windmills*.
b. *The American Economic System*.

Filmstrips

a. *Energy Crisis: What Can We Do, Part II*.

Films

a. *Now That the Dinosaurs Are Gone*.
b. *Nuclear Power: Questions and Answers*.

Seventh Grade thru Ninth Grade

Social Studies

Activities:

a. Demonstrate the uses and abuses of energy through role playing.

b. Bring in newspaper articles to be posted on an "Energy Bulletin Board".

c. Using magazines from the library, find evidence of increasing uses of energy uses during the last five year.

d. Debate: "Why Should Man Conserve Energy?"

e. Calculate passenger miles per gallon for various vehicles carrying different loads. Resource: Transportation and the City grades 8,9.

f. Study "Issues of Nuclear Energy" (The Energy Challenge).

g. Study and interpret "Supply and Demand Chart" (The Energy Challenge).

h. Discuss the political and social implications of today's imbalance in energy use.

Resources:

Books

a. The Energy Challenge.
b. Interdisciplinary Student/Teacher Materials in Energy, The Environment and the Energy: Transportation and the City.

Seventh Grade thru Ninth Grade

Science

Activities:

a. Complete worksheets from The Energy Challenge.

b. Participate in a field trip to Sunovations Co. (See Appendix A: Field Trip Possibilities for information).

c. Participate in energy game.

d. Complete activities from Energy-Environment Mini-Unit Guide.

e. Utilize information from textbooks, encyclopedias and library materials to write research reports on energy.

f. Read and discuss articles from Current Energy and Ecology magazine.

g. View and discuss transparencies from Current Energy and Ecology.

h. View and discuss the filmstrip with cassettes entitled Economics of the Energy Problem.

i. Read and discuss articles from Energy and Education magazine.

j. Collect and present current events related to energy.

k. Have the students participate in the activity Test Your EQ.

l. View slide presentation on America Runs on Electricity.

m. Study Nuclear Power and the Environment: Questions and Answers.

n. View slide presentation entitled The Energy Crisis.

Resources:

Books

a. Energy-Environment Mini-Unit Guide.
b. Nuclear Power and the Environment: Questions and Answers.
c. The National Energy Problem.

Seventh Grade thru Ninth Grade

Pamphlets/Bookets

a. *Energy and Education*.
b. *Energy Conservation*. pp. 8-10.
c. *Environmental Education Strategies for Wise Use of Energy*. "Test Your EQ". pp. 36-37.
d. *How A Bill Becomes A Law To Conserve Energy*.

Periodicals

a. *Current Energy and Ecology*.

Games

a. *Crisis*.
b. *Energy Awareness Card Game*.
c. *Four Energy Games*.

Filmstrips

a. *Economics of the Energy Problem*.

Slides

a. *America Runs on Electricity*.
b. *The Energy Crisis*.

Others

a. "Ecology and Energy Action Pack."

Seventh Grade thru Ninth Grade

Mathematics

Activities:

- a. Have the students solve word problems dealing with energy matters (e.g. cost of living, energy situations, consumption, and statistics) included in *Math and Environmental Pollution*.
- b. Construct line, bar, and circle graphs. See *The Energy Challenge* for related ideas.
- c. Read and interpret bar, line, and circle graphs. See *The Energy Challenge* for problems.

Resources:

Books

- a. *Energy-Environment Mini-Unit Guide*.
- b. *The Energy Challenge*.

Pamphlets/Booklets

- a. *Environmental Education Strategies for Wise Use of Energy*.

Health and Physical Education

Activities:

- a. Research and discuss the effects of pollution from energy-producing sources that will effect the body and ways to best deal with these.
- b. Investigate possible hazzards of living in an environment that has been altered by excessive energy production.

Concept 4

Practical application of energy conservation must be practiced.

Language Arts

Activities:

a. Use role playing to demonstrate practical ways to conserve energy. Students mights also show how energy is wasted. Class discussion can simulate ideas to be used here.

b. Hold an essay contest. Local winners could send entries to Duke Power Essay Contest.

c. Invite resource people to come in and talk to students about ways to conserve energy. As a follow up, students could write thank-you letters to the resource speaker and list ways they plan to conserve.

d. Have students write energy conservation slogans and jingles. These could be illustrated with art work. Students might want to write jingles to fit familiar tunes.

e. Let students create their own commerical advertising for a product they feel would help conserve energy. These commericals could promote any type of energy conservation. Suggest that activities using music or art be included.

f. Set aside a special area in the classroom to display creative writing on energy conservation, such as plays, short stories, poems, songs, essays, and advertisements. Give the center a special title such as "Creative Conservationists". Then, have students name their centers.

g. Have students perform plays they have written on energy conservation. If possible these could be performed for other classes in the school.

h. Play "Four Energy Games", or have students develop and play their own game.

Resources:

Books

a. Energy: Why We Must Conserve Now.

b. Reading-Science-Math Drive-In Conference.
c. The Energy Challenge.

Pamphlets/Booklets

a. Organizing School Energy Contests.
b. The Story of Electricity.

Games

a. Four Energy Games.

Filmstrips

a. Energy Crisis: What Can We Do?

Films

a. The Search for New Energy. Part I.
b. The Search for New Energy. Part II.

Others

a. "Your Energy World."

Social Studies

Activities:

a. Discuss ways to save energy, "How long might our oil last?"

b. Research and discuss the possibilities of using energy from the sun.

c. Label the parts of a solar panel.

Resources:

Books

a. The Energy Challenge.

Seventh Grade thru Ninth Grade

Science

Activities:

a. Find out which types of clothing help to retain body heat.

b. Make a study of the effect of lowered urban highway illumination on crime and vandalism.

c. View films and filmstrips on energy conservation.

d. Discuss magazine articles on homes of the future.

e. Complete worksheets from *The Energy Challenge* and *Living With Energy*.

f. Read and discuss articles in *Energy and Education* magazine.

g. Collect and discuss current events pertaining to energy uses.

h. Read and discuss pamphlets listed below.

i. Have the students participate in energy games.

j. Learn how to read electric meters.

k. Calculate energy math problems.

l. Let students test their Energy Quotient.

m. Have students conduct a survey at their homes and school regarding energy efficiency.

n. View and discuss the slide presentation, *America Runs on Electricity*.

o. Study *Nuclear Power and the Environment: Questions and Answers*.

p. View a slide presentation, *The Energy Crisis*.

Resources:

Books

a. *A Handbook for the Serious (and Not So Serious) Energy Saver*.

b. Games for the Science Classroom. "Environmental Realities", p.74.
c. Nuclear Power and the Environment: Questions and Answers. pp. 12-16.
d. The Energy Challenge. activities 6,8,9,10,11,12,17,18.

Pamphlets/Booklets

a. All About Energy.
b. Energy and Education.
c. Energy Conservation. pp. 8-19.
d. Environmental Educational Strategies, "Conservation of Energy at Home and at School", pp. 39-47.
e. Environmental Educational Strategies, "Energy Bingo", p. 34-35.
f. Environmental Educational Strategies, "Energy Mathematics", p.26-30.
g. Environmental Educational Strategies, "Meter Reading", pp. 22-25.
h. Environmental Educational Strategies, "Test Your EQ", pp. 36-37.
i. Environmental Educational Strategies, "Value Judgements", pp. 19-21.
j. Living With Energy. Worksheets 1 through 5.
k. The Energy Conserver.

Periodicals

a. Mother Earth News. "Homes of the Future." pp. 101-103.
b. The Science Teacher. pp. 19-24.

Games

a. Crisis.
b. Energy Awareness Card Games.
c. Four Energy Games.

Slides

a. America Runs on Electricity.
b. The Energy Crisis.

Seventh Grade thru Ninth Grade

Mathematics

Activities:

a. Have the students do word problems dealing with reading and interpreting energy meters and bills (e.g., electrical bills, water meters, gas meters).

b. Have the students solve problems comparing the cost and consumption of the various types of energy.

c. Have the students do research and make up mathematics problems figuring the amount of energy used by different appliances and pieces of equipment, then exchange with other students and solve them.

d. Make up and solve math problems figuring gas milages and cost of transportation.

e. Practice math skills and problem solving in budget planning, cost of living, and consumer math.

Resources:

Books

a. Energy-Environment Mini-Unit Guide.
b. Mathematics in Energy. pp. 22-35, 54-62, 65-66.

Pamphlets/Booklets

a. Award Winning Energy Education Activities.
b. Environmental Education Strategies for Wise Use of Energy.

Seventh Grade thru Ninth Grade

Health and Physical Education

Activities:

a. Explain proper ways to use the body to both generate and conserve energy.

b. Emphasize nutrition, excercise and good health habits and their effect on the human body for more effective production.

c. Advertise benefits of physical fitness and abstention from substances harmful to bodies through posters and classroom discussions.

d. Emphasize conservation of water and energy when using gym facilities.
Suggestions:
1. Put a time limit on showers (e.g. 1 min.)
2. Use only every other light (or every other row of lights) in a gym.
3. Use natural light whenever possible.
4. Set temperature in gym 15 degrees lower than rest of building and keep doors closed.
5. Run washers and dryers only when full.
6. Encourage car-pooling to and from athletic practices and events.

Seventh Grade thru Ninth Grade

Art

Activities:

a. Do projects, posters, collages, etc. illustrating themes related to energy conservation.

b. Foster conservation habits when using art equipment and supplies (e.g., do not fire kiln until full).

Resources:

Books

a. The Energy Challenge. "A Delicate Balance", p. 19.

Pamphlets/Booklets

a. Award Winning Energy Education Activities. "Energy in Art".

Business

Activities:

a. Emphasize conservation of energy when using electrical equipment in Business Education Labs.

b. Emphasize the importance of energy conservation of education materials used in Business Labs.

c. Have students type memos concerning practices of energy conservation.

Resources:

Others

a. "Your Energy World."

Home Economics

Activities:

a. Emphasize the practical application of:
   1. making structures more energy efficient through proper use of insulation, home furnishings, appliances, etc.,
   2. conservation techniques when using appliances,
   3. meter reading, and
   4. proper use of clothing for added warmth/cooling.

b. Carry on discussions and debates about consumer concerns (e.g., power bills).

c. Emphasize recycling as a means of energy conservation.

d. Arrange field trips (See Appendix A: Field Trip Possibilities for information).

Resources:

Books

a. Citizen's Workshop on Energy and the Environment Handbook.
b. Eco-Tech: The Whole Earth's Guide to the Alternate Society.
c. The Energy Challenge, activity masters 8 and 9.
d. The Project Planner.
e. 350 Ways to Save Energy and Money in Your Home and Car.

Pamphlets/Booklets

a. Energy Conservation: Understanding and Activities for Young People.
b. How to Save Money by Insulating Your Home.
c. Saving Energy at Home.
d. 65 Ways to Save Natural Gas.
e. Tips for Energy Savers.
f. Your Electric Meter: The Story in a Nutshell.

Others

a. "Your Energy World." Unit 1 and 3.

Seventh Grade thru Ninth Grade

Concept 5

Technology has led to machinery designed to utilize energy.

Language Arts

Activities:

a. Have students make a collage from pictures of different styles of machinery which utilize our energy.

b. View films to help students become aware of the vastness of technology.

c. Have students discuss or write a report on how they feel technology can best be used to conserve energy.

d. Ask students to compile a list of all the machines that utilize energy at home, in their community, on the way to and from school, and at school.

e. Do mini-research papers on different types of technology and their impact on our energy supply. Along with library references, students might contact local industries for free materials related to their topics.

f. Have each student select a famous inventor who has contributed to the advancement of technology. Then have the student research the inventor and prepare material for a television interview concerning the inventor. Assign a student to be the emcee and let other students be guests, portraying the inventor they researched.

g. Take a field trip (See Appendix A: Field Trip Possibilities for information).

Resources:

Pamphlets/Booklets

a. Lewis Howard Latimer: A Black Inventor.

Films

a. Energy: What About Tomorrow?
b. Joey's World.
c. Mr. Edison's Dilemma.

Social Studies

Activities:

a. Trace coal from the mine to your electric bill. See The Energy Challenge for information.

b. Interview someone who is old enough to remember what life was like before the days of huge-sale reliance on oil.

c. Diagram two kinds of electric power plants. See The Energy Challenge for information.

d. Do research on the following: wind power, geothermal energy, coal gasification, coal liquefaction, and oil shale.

e. Use the media center to do research reports on inventions and inventors related to energy.

f. Make a graph showing the growth of industry and the use of natural resources.

Resources:

Books

a. Energy, Engines, and the Industrial Revolution.
b. The Energy Challenge, activity masters 2,8,18.

Pamphlets/Booklets

a. How A Bill Becomes A Law to Conserve Energy.

Filmstrips

a. Planning the Human Community. "Industry, Employment, and Transportation".

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Seventh Grade thru Ninth Grade

Science

Activities:

a. View and discuss the film, Mr. Edison's Dilemma.

b. Diagram fluorescent and incandescent tubes, explain how they work, and compare the amount of energy used by each.

c. Study the operation of internal combustion engines placing stress on their efficiency.

d. Do research projects on contributions of an inventor to science.

e. Complete activity worksheets from The Energy Challenge.

f. Read and discuss attitudes in Energy and Education magazine.

g. Collect and discuss current events pertaining to recent technological advances.

h. Study Nuclear Power and the Environment: Questions and Answers.

Resources:

Books

a. Nuclear Power and the Environment: Questions and Answers, pp 17-24.
b. The Energy Challenge, activity 12.

Pamphlets/Booklets

a. Energy and Education.

Films

a. Mr. Edison's Dilemma.

Annotated Bibliography[1]

Books

A Handbook for the Serious (and Not So Serious) Energy Saver.

Order from:
Duke Power Company
Consumer Education Department
Greensboro, N.C.

Angels, Joseph A. Stamps Tell the Story of Nuclear Energy. Oak Ridge, Tenn., U.S.E.R.D.A.

This is a short comprehensive book that introduces the world of the atom through the use of selected atomic postage stamps. Order from:
Technical Information Center
P.O. Box 62
Oak Ridge, Tenn. 37830.

Angene, et al. Myths, Fables & Legends. Lexington, Mass.: Ginn and Co., 1975. p.11.

Branley, Franklyn M. Solar Energy.

This book has 117 pages with easy, practical experiments included in the text. It is illustrated with clear, detailed drawings and diagrams.

Citizen's Workshop on Energy and the Environment Handbook.

Topics in this book include: "Energy and the Environment", "Conservation", "The Future" and "Important Energy Words, a Glossary". Order from:
Office of Public Affairs
U.S. Department of Energy
Washington, D.C. 20585.

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[1] All available information on resources is included in each reference.

Seventh Grade thru Ninth Grade

Connery, Robert H., and Gilmour, Robert S. The National Energy Problem. New York: The Academy of Political Science.

This is a 194-page book that may be ordered from:
The Academy of Politial Science
2852 Broadway
New York, N.Y. 10025.

de Rapp, Robert S. Eco-Tech: The Whole Earth's Guide to the Alternate Society. Delacorte Press.

This is a concise and practical guide to the skills and basic knowledge necessary for conservation and healthful living. Dr. de Rapp, a bio-chemist, focuses on practical ways of meeting energy needs.

Energy-Environment Mini-Unit Guide.

Order from:
N.S.T.A.
1742 Connecticut Ave. N.W.
Washington, D.C. 20009.

Energy: Why We Must Conserve it Now.

This is an introduction to the energy problem, historical, present uses and future projections. Order from:
Duke Power Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Games for the Science Classroom.

This publication provides teachers with science and science-related games. Each of the 130 entries gives the following information: title, grade level, purpose, playing time, number of players, price, developer, source description, preparation and comments. Order from:
N.S.T.A.
1742 Connecticut Ave., N.W.
Washington, D.C. 20009

Seventh Grade thru Ninth Grade

Interdisciplinary Student/Teacher Materials In Energy, The Environment and the Economy: Energy, Engines and the Industrial Revolution: U.S. Department of Energy.

This book has 82 pages of objectives, teaching strategies and charts.

Interdisciplinary Student/Teacher Materials In Energy, The Environment and the Economy: Transportation and the City: U.S. Department of Energy, Washington, D.C.

This source consist of 46 pages with several student activities concerning transportation.

Mathematics in Energy: U.S. Department of Energy, Washington, D.C.

This book has 72 pages of basic mathematical skills for eighth and ninth graders. The students solve problems which help to make them more aware of their energy dependency.

Nuclear Power and the Environment: Questions and Answers: American Nuclear Society, 1976.

Topics included in this book's 122 pages are "Energy Perspective and Nuclear Power", "Radiation", "Thermal Discharges" and "Safety Concerns".

Rashback, Roger. *The Project Planners*. New York: Walker and Company.

Sections of this book deal with how to solve present-day energy problems with age-old techniques. A look at our past can help our future.

Reading-Science-Math Drive-In Conference. April 25, 1978. Available through science coordinator, Guilford County School System, Central Office.

This book contains many activities that correlate subject areas in various lessons on energy.

Spies, Henry R. *350 Ways to Save Energy and Money in Your Home and Car*.

This book consists of 198 pages of practical things you can do now to save energy and money in your home and car.

Seventh Grade thru Ninth Grade

Suttles, Patricia H. *Educator's Guide to Free Social Studies Materials*.

This book contains over 3,860 free social studies materials.
Order from:

Educator's Progress Service, Inc.
Randolph, Wisconsin 53926.

The Energy Challenge.

This is an activity master program about our energy past, present and future suitable for grades five through eight.
Order from:

Federal Energy Administration
Box 14306
Dayton, Ohio 45414.

Pamphlets/Booklets

All About Energy. Dow Chemical Co.

An introduction to energy is provided for upper elementary students in this booklet.

The America Economic System - Your Part in It.

This booklet illustrates ideas about energy and the economic system with characters from the "Peanuts" comic strip. Order from:

Duke Power Co.
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Award Winning Energy Education Activities.

This booklet has 38 pages of ideas on energy activities which can fit into regular courses of study and further the student's understanding of important energy issues.
Order from:

N.S.T.A.
1742 Connecticut Ave., N.W.
Washington, D.C. 20009.

Seventh Grade thru Ninth Grade

Energy Activities With Energy Ant.

This booklet focuses on energy and how to use it wisely. Available from:
Federal Energy Administration
Office of Communications and Public Affairs
Washington, D.C. 20461.

Energy and Education.

This newsletter may be received by requesting that your name be put on mailing list. Order from:
N.S.T.A.
1742 Connecticut Ave. N.W.
Washington, D.C. 20009.

Energy Conservation: Understanding and Activities for Young People.

This is a good introductory guide to energy, focusing on the sources of energy, its conservation and uses. It provides both knowledge and activities. Order from:
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402.

Environmental Educational Strategies for Wise Use of Energy.

This booklet contains 71 pages of instructional activities and resources from which teachers can develop units of study on energy. It is an excellent guide for grade K-12. Order from:
N.C. Department of Public Instruction
Raleigh, N.C. 27611.

Factsheets.

This is an excellent monthly publication containing current information of interest to teachers. Order from:
Technical Information Center
P.O. Box 62
Oak Ridge, Tenn. 37830.

Seventh Grade thru Ninth Grade

How a Bill Becomes a Law to Conserve Energy.

This booklet (115 pages) consists of interdisciplinary student/teacher materials on energy, the environment, and the economy. Order from:

N.S.T.A.
1742 Connecticut Ave. N.W.
Washington, D.C. 20009.

How to Save Money by Insulating Your Home.

Order from:

Federal Energy Commission
Washington, D.C. 20461.

Keowee-Toxaway: The Story of Energy.

The twelve pages of this pamphlet include the story of energy, electricity, hydroelectrics, coal-fueled generators, nuclear power and radiation. Order from:

Duke Power Company
P.O. Box 2178
Charlotte, N.C. 28701.

Let's Stop Tilting at Windmills.

This pamphlet contains a review of the basic facts about energy and economy. Order from:

Duke Power Company
P.O. Box 2178
Charlotte, N.C. 28701.

Lewis Howard Latimer: A Black Inventor.

This pamphlet is a short biography of Mr. Latimer followed by seven simple experiments. Order from:

Duke Power Company
P.O. Box 2178
Charlotte, N.C. 28701.

Seventh Grade thru Ninth Grade

Living With Energy.

This booklet is an activity guide for teachers and students. Order from:

Standard Oil Company
Mail Code 3705
200 East Randolph Drive
Chicago, Ill. 60601.

Organizing School Energy Contests.

This pamphlet contains information regarding school energy contests. Order from:

Community Relations and Public Education Office
Federal Energy Administration
Washington, D.C. 20461.

Saving Energy at Home. Program Development System, Department of Community Colleges, Raleigh, N.C.

This publication consists of eight seperate modules developed to examine the energy situation. The pamphlets are entitled: "An Overview", "Environment", "Energy Leaks", "Windows and Doors", "Insulation", "Mechanical Systems", "Home Modifications", and "More Information".

65 Ways to Save Natural Gas.

This is a brief pamphlet with common sense ways to save energy in the home. Order from:

Office of Public Affairs
U.S. Department of Energy
Washington, D.C. 20585.

The Story of Electricity.

This pamphlet deals with the history of electricity from its discovery through present times. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Seventh Grade thru Ninth Grade

Tips for Energy Savers.

This is a 46 page booklet with tips on ways to save energy in the home, on the road, and in the market place. Order from:
Energy Research and Development Administration
Federal Energy Administration
Washington, D.C.

Your Electric Meter: The Story in a Nutshell.

This booklet explains how a meter works, how to read one, etc. It has a chart that indicates the estimated energy usage by electrical appliances. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Periodicals

Current Energy and Ecology. Curriculum Innovations, Inc. (May 1978).

Henderson, George L. "Math and Environmental Pollution," Journal of Wisconsin Mathematics Council, Vol. 21, No. 2 (Spring, 1970), pp. 5-6.

This is a two-page article on the relationship between math and pollution.

The Energy Conserver. Division of Science, N.C. Department of Public Instruction, Raleigh, N.C.

This is a good introduction to any unit on energy and is sent to each school monthly.

The Mother Earth News, (March/April, 1978).

This entire magazine features aricles on energy activities for children.

Seventh Grade thru Ninth Grade

The Science Teacher, Vol. 45, No. 4 (April, 1978).

This entire magazine features articles on energy activities for children.

Games

Milton Bradley Co. *4 Energy Games*.

N.C. Department of Public Instruction. *Crisis*, *Energy Awareness Card Game*, and *Fox City*. Division of Science, N.C. Department of Public Instruction.

These games feature role playing in which the students are involved in making decisions that affect resources.

Filmstrips

Conserving Our Natural Resources. The National Audubon Society, Randon House. (sound)

This filmstrip is available on free loan from the Greensboro Public Library. It deals with ways to conserve natural resources.

Geology and You, *The Changing Land*, *The Restless Earth*, *The Face of the Earth*, *The World of Energy*, National Geographic Society. (color/tapes)

These filmstrips are good for introducing a unit on energy conservation in the eighth grade.

Introduction to Energy, *Chemical Energy*, *Electrical Energy*, *Mechanical Energy*, *Nuclear Energy*, *What Lies Ahead*. Clearing House, Inc.

Man's Search for Energy. McGraw-Hill Films.

Our Minerals and Energy Resources. Covonet Films.

Seventh Grade thru Ninth Grade

Planning the Human Community. SVE,. 1974.

The Economics of the Energy Problem. Mt. Kisco, N.Y.: Teaching Resource Films, 1976. (cassette)

The Energy Crisis: What Can We Do, Parts I and II.

This filmstrip is available on free loan from the Greensboro Public Library.

Films

Energy, Ability to Do Work. AIMS Instructional Media Services. (color, 16mm, sound)

Energy Challenge, Energy, and Energy: 2000.

Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Energy: What About Tomorrow? United Nations. (color, 16 mm, 20½ min.)

This film is available on free loan from the Greensboro Public Library. It deals with new technology which permits the development of alternate energy resources, solar, geothermal and fusion.

Energy and Ecology: The Great Debate. Modern Talking Pictures.

Energy in Perspective. Modern Talking Pictures.

Joey's World. (16 mm., 25 min.)

This film explores the world wide energy supply and demand.
Order from:
Duke Power Co.
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Seventh Grade thru Ninth Grade

Living With Energy. Modern Talking Picture Service.
(16 mm, color, sound, 26 min.)

Mr. Edison's Dilemma. (18 min)

This film portrays the financial facts of life in the business of supplying electrical energy. Order from:

Duke Power Co.
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Now That the Dinosaurs Are Gone. Atomic Industrial Forum.
(26 min.)

This film explains the rationale for nuclear energy. Order from:

Duke Power Co.
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Nuclear Energy: Power for Today and Tomorrow. Modern Talking Pictures.

Nuclear Power: Questions and Answers. (16 mm, 25 min.)

This films deals with problems and issues of nuclear power. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

Offshore Search for Oil and Gas. Modern Talking Pictures.

Oil. (color, 16 mm, 18 min.)

This film is a brief survey of the oil industry. Order from:

Shell Film Library
1433 Cir. W. Drive
Indianapolis, Ind. 46239.

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Seventh Grade thru Ninth Grade

Research: The Search for New Energy, Parts I and II. Ciba-Geigy. (color, 16 mm, 14½ min. each)

These films deal with efforts of scientists and engineers to discover and develop new sources of fuel in order to solve problems created by the energy crisis. Order from:
Guilford County Film Library.

Seeking and Conserving Mineral Resources. (16 mm, 13 min.)

This film probes efforts to develop resources while protecting the ecosystem. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

The Fossil Story. (color, 19 min.)

Order from:
1433 Sadlier Cir. Drive
Indianapolis, Ind. 46239.

The Great Search. Walt Disney. (16 mm, 13 min)

This film emphasizes some fundamentals concerning man's use of energy. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28701.

The Road To Energy, U.S.A., No. 31142. Modern Talking Pictures.

The Three E's (Energy, Economics, Environment).

Order from:
Public Affairs Department
EXXON, U.S.A.
P.O. Box 2180
Houston, Texas 77001.

Seventh Grade thru Ninth Grade

Slides

America Runs on Electricity. ESEA, Title III Program.

This program focuses on different energy sources, how we can use electricity and how we can conserve our resources by reducing our energy consumption. Order from:
Guilford County Film Library.

Solar Cells. Electrical Engineering Department. A. & T. State University.

The Energy Crisis. (160 color slides, 2 LP's, 2 cassettes, teacher's guide)

This slide-sound show is in 2 parts, covering: types and sources of energy, why we are running low, possible consequences and solutions, and the major view points of leading protagonists around the world. Available from:

Education Design, Inc.
47 West 13 Street
New York, N.Y. 10011.

Wood as an Alternate Source.

Order from:

Ultra Systems, Inc.
Washington, D.C.

Others

"Conservation." (picture discussion kit)

Order from:

American Petroleum Institute
1801 K Street, N.W.
Washington, D.C. 20006.

Seventh Grade thru Ninth Grade

"Ecology and Energy Action Pack."

This pack contains activity masters and a transparencey pertaining to energy awareness. Available from:
McDonald's Corporation
One McDonald Plaza
Oak Brook, Ill. 60521.

"Energy Ant and the Grasshopper." (poster)

Order from:
Federal Energy Administration
Washington, D.C.

"Geothermal." (wall chart)

Order from:
Office of Public Affairs
Energy Research and Development Administration
Washington, D.C. 20545.

"Meter Reading." (mini lesson)

Order from:
State Department of Public Instruction
Raleigh, N.C.

"Science in the Search for Oil." (wall chart)

Order from:
American Petroleum Institute
1801 K Street, N.W.
Washington, N.C. 20006.

"The Wide World of Energy Multimedia Kit. Mickey Mouse and Goofey."

To order "The Comic Book", write to:
Public Affairs Department
EXXON, U.S.A.
P.O. Box 2180
Houston, Texas 77001.
To order "The Kit", write to:
Walt Disney Educational Media Co.
500 S. Buena Vista Street
Burbank, CA. 91521.

Seventh Grade thru Ninth Grade

"Your Energy World." (Spirit duplicating masters)

Order from:
Office of Marketing and Education
U.S. Department of Energy
Washington, D.C. 20545.

Tenth Grade thru Twelfth Grade [1]

Ralph Bare	Richard Hice
Frank Calhoun	Alonzo McCullough
Wanda Croom	Peggy Camp
Kathy Goolsby	Sue Yoder

Introduction

Teachers representing the subject areas of English, occupational education, science, and social studies and a media specialist participated in the development of this section of the Guide.

Broad concepts were identified which encompass several disciplines. They were developed with an interdisciplinary approach in mind and can be integrated into many subject areas. Activities are suggested to convey each concept and sources for these activities are indicated. Other sources, broader in context, are also mentioned.

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[1] Representatives from grades 10-12 participated in the development of this section of the Guide. School representatives identified possible resources in spring, 1978, and the individuals listed above developed the concepts and activities in this section and matched resources to them.

Tenth Grade thru Twelfth Grade

List of Concepts

1. In the past, man has used himself, animals, and the sun as sources of energy.
2. Today, man uses fossil fuel, solar and nuclear energy.
3. The world has an energy problem today, because there is an unequal distribution of fossil fuel resources, uneven technological advancement, and an imbalance in the world's population.
4. The modern world demands an equitable sharing of its resources.
5. World-wide cooperation is necessary to protect the environment while developing energy supplies for all peoples.
6. Energy conservation begins at home.
7. Energy conservation should be considered in the construction of buildings.
8. Since man and his environment are interdependent, we must consider environmental consequences, as we attempt to meet our energy requirements.
9. It is necessary to manage and/or conserve energy used industrially and commercially.
10. In order to teach energy conservation, we must change people's attitudes toward energy consumption.
11. In the future, man will use more solar and nuclear energy and rely less on fossil fuels.

Tenth Grade thru Twelfth Grade

Concept 1

In the past, man has used himself, animals, and the sun as sources of energy.

Activities:

a. Discuss man's uses of energy in the past after reading *More or Less: Education for Future Designs, Module #4. The Environment*.

b. Have the students do research and original projects to reinforce classroom discussions.

c. Investigate the sun as a source of energy and debate the merits and shortcomings of this source.

d. Using biology texts show the sun's role in food production through photosynthesis.

e. Trace the change from man power to horse power to the use of machines and show this development on an original filmstrip with script or tape.

Resources:

Books

a. *American Society*.

Pamphlets/Booklets

a. *Environmental Education: Strategies for Wise Use of Energy*.
b. *Factsheets*.
c. *More or Less; Education for Future Designs, Module #4. The Environment*.
d. *Solar Energy*.

Films

a. *Bridge to Tomorrow*.
b. *Joey's World*.

Tenth Grade thru Twelfth Grade

Concept 2

Today, man uses fossil fuels, solar, and nuclear energy.

Activities:

a. List and discuss types and sources of fossil fuels.

b. Show the uses of solar energy with the aid of speaker/demonstrations (See Appendix A).

c. Use pamphlets and booklets to prepare reports (See Annotated Bibliography).

d. Debate the issues involved in the use of nuclear energy.

e. Prepare reports on, "Fossil Fuels: Buried Sunshine".

f. Do experiments that show how coal can be gasified by destructive distillation.

g. Research and discuss the use of lower grades of coal and their effects on the environment.

h. Do activities that show possible uses of solar energy.

i. Take a field trip. Examples: North Carolina State University, Burlington Engineering Lab (See Appendix A: Field Trip Possibilities for information on sites).

Resources:

Books

a. Nuclear Power and the Environment: Questions and Answers.

Pamphlets/Booklets

a. Award Winning Energy Education Activities for Elementary and High School Teachers.
b. Fossil Fuel - Oil.
c. Solar Energy.

Others

a. "Science Activities in Energy".

Tenth Grade thru Twelfth Grade

Concept 3

The world has an energy problem today, because there is an unequal distribution of fossil fuel resources, uneven technological advancement, and an imbalance of the world's population.

Activities:

a. Use classroom wall maps to locate the following: population distribution, resources, economic development, and political ties.

b. Develop an understanding of gross national product and per capita income, using *Energy in the Global Marketplace*.

c. Use role-playing simulation called "Black Gold", *Award Winning Energy Education Activities*.

Resources:

Books

a. *The Energy Crisis*. pp. 49-52.
b. *Environmental Concerns: The Nation*. pp 34-37, 102-105.
c. *Free Enterprise in America*. pp. 102-105.

Pamphlets/Booklets

a. *Award Winning Energy Education Activities for Elementary and High School Teachers*.
b. *Energy in the Global Marketplace*.
c. *More or Less: Education for Future Designs, The Environment*.

Tenth Grade thru Twelfth Grade

Concept 4

The modern world demands an equitable sharing of its resources.

Activities:

a. Learn to recognize the OPEC nations using maps.

b. Learn to recognize countries which use the most resources.

c. Select and do a variety of activities from The Energy Challenge.

d. Use lessons from U. S. Energy Policy - Which Direction?

Resources:

Books

a. American Society.
b. The Energy Crisis.

Pamphlets/Booklets

a. The Energy Challenge.
b. Energy in the Global Marketplace.
c. How a Bill Becomes a Law to Conserve Energy.
d. U. S. Energy Policy - Which Direction?

Tenth Grade thru Twelfth Grade

Concept 5

World-wide cooperation is necessary to protect the environment while developing energy supplies for all peoples.

Activities:

a. Use current newspapers and magazines to illustrate environmental problems (oil spills, fishing limits, nuclear wastes, etc.).

b. Discuss the responsibilities of individuals and/or groups in decision-making procedures at local, state, and national levels.

Resources:

Books

a. *American Society*.
b. *Environmental Concerns: The Nation*.
c. *Scholastic American Citizenship Program*.
d. *World Cultures*.

Games

a. *Crisis Game*.

Tenth Grade thru Twelfth Grade

Concept 6

Energy conservation begins in the home.

Activities:

a. Do a home survey for energy conservation, using checklist, p. 41, Environmental Education: Strategies for Wise Use of Energy.

b. Learn to read electric meters, p. 22, Environmental Education: Strategies for Wise Use of Energy.

c. Do an exercise in making value judgements concerning priorities of energy, p. 19, Environmental Education: Strategies for Wise Use of Energy.

d. Plan and carry out an "Energy Conservation Week", reading meters for a typical week, then for one in which efforts were made to conserve.

Resources:

Books

a. Energy Conservation in the Home.

Pamphlets/Booklets

a. A Handbook for the Serious (and Not so Serious) Energy Savers.
b. Energy Conservation Experiments.
c. Energy - Why We Must Conserve it Now?
d. Environmental Education: Strategies for Wise Use of Energy.
e. Home Energy Conservation Checklist.
f. How to Read Your Electric Meter.
g. How to Save on Your Electric Bill.
h. Our Energy - Problems and Solutions.
i. Saving Energy at Home.
j. Tips for Energy Saving.
k. What Everyone Should Know About Electric Safety.
l. Your Electric Meter: The Story in a Nutshell.

Tenth Grade thru Twelfth Grade

Concept 7

Energy conservation should be considered in the construction of buildings.

Activities:

a. Design an energy efficient house, p.30, Award Winning Energy Education Activities.

b. Have a speaker talk to the class about the construction of energy efficient houses.

c. Use the activity, p.42, Energy Conservation in the Home.

d. Take a field trip to a house under construction. Look for types of materials used in making it more energy efficient (insulation, window seals, etc.).

e. Study methods of capturing passive solar energy.

Resources:

Books

a. Energy Conservation in the Home.

Pamphlets/Booklets

a. Award Winning Energy Education Activities for Elementary and High School Teachers.
b. Blueprint for Large Scale Savings.
c. Insulation Guide for Homes and Apartments.
d. The Heat Pump.
e. Passive Design Ideas for the Energy Conscious Consumer.
f. Saving Energy at Home.
g. When it Comes to Conserving Energy, Brick Makes a Difference.

Tenth Grade thru Twelfth Grade

Concept 8

Since man and his environment are interdependent, we must consider all environmental consequences as we attempt to meet our energy requirements.

Activities.

a. Use the *Energy Environment Simulator* to emphasize the complexities of the energy situation.

b. Emphasize the danger of the ocean in attempting to secure new oil supplies by using the role-playing activity, p. 18, *Award Winning Energy Education Activities*.

c. Investigate energy use in the packaging of goods, using local litter and consequent environmental damage as a focus, pp. 21-23, *Award Winning Energy Education Activities*.

d. Relate the recycling process to the low level of energy consumption necessary for recycling, pp. 4-5, *Award Winning Energy Education Activities*.

e. To emphasize the problem of air pollution resulting from motor vehicles, factories, and power plants, use data to make circle and bar graphs, p. 36, *Environmental Education, Problems, Projects, and Exercises*.

f. Visit Colonial Pipelines to learn about conservation measures observed in transportation of petroleum products (See Appendix A).

Resources:

Books

a. *The Energy Crisis*.
b. *Environmental Concerns: The Nation*.
c. *Games for the Science Classroom*.

Pamphlets/Booklets

a. *Anybody Out There Think The Energy Crisis is Over?*
b. *Award Winning Energy Education Activities for Elementary and High School Teachers*.
c. *The Energy Challenge*.
d. *Energy Conservation Experiments*.
e. *Environmental Education, Problems, Projects, and Exercises*.

Tenth Grade thru Twelfth Grade

Periodicals

a. *Conservation News*.
b. *The Energy Conserver*.
c. *Urban Composting: A New Approach to an Old Practice*.

Filmstrips

a. *Young Scientists Investigate Pollution*.

Games

a. *Crisis Game*.
b. *Energy-Environment Simulator*.

Concept 9

It is necessary to manage and/or conserve energy used industrially and commercially.

Activities:

a. Explore the energy use in the school building, p.19, Award Winning Energy Education Activities.

b. Use transparencies to show how the U. S. uses its energy and discuss where and how it can be conserved, p. 54, Environmental Education: Strategies for Wise Use of Energy.

c. Have a resource person from industry speak on the management of energy resources (See Appendix A).

d. Take a field trip. Example: Greensboro Energy Commission, using the School Plant as a Learning Lab. (See Appendix A: Field Trip Possibilities for information on the sites).

Resources:

Pamphlets/Booklets

a. Award Winning Energy Education Activities for Elementary and High School Teachers.
b. Energy Management, '78.
c. Environmental Education: Strategies for Wise Use of Energy.
d. Our Energy - Problems and Solutions.

Tenth Grade thru Twelfth Grade

Concept 10

In order to teach energy conservation, we must change people's attitudes toward energy consumption.

Activities:

a. After having presented general background information about energy conservation, discuss with the students the importance of attitudes.

b. Use a game to reinforce developing attitudinal changes:
Games for the Science Classroom,
Crisis and Energy-Environment
Simulator from Citizen's Workshop....

c. Sponsor a contest for the best essay on the energy crisis. This may be done as a creative writing assignment or as a school wide project.

d. See pp. 40-43, Environmental Concerns: The Nation, on the use of poetry in teaching energy conservation.

Resources:

Books

a. American Society.
b. The Energy Crisis.
c. Environmental Concerns: The Nation.
d. Free Enterprise in America.
e. Games for the Science Classroom.

Games

a. Crisis Game.
b. Energy-Environment Simulator.

Tenth Grade thru Twelfth Grade

Concept 11

In the future, man will use more solar and nuclear energy and rely less on fossil fuel.

Activities:

a. Use various activities from The Energy Challenge.

b. Invite a speaker from Duke Power Company to show a film and speak to the students.

c. Debate the issues concerning the use of nuclear energy for power production.

d. Research the possibilities of using the fusion process to eliminate pollution problems when using nuclear energy.

e. Do experiments that show how solar energy can be used in heating, cooling, cooking, etc. (See "Science Activities in Energy" for suggestions).

Resources:

Books

a. Nuclear Power and the Environment: Questions and Answers.

Pamphlets/Booklets

a. Ocean Thermal Energy Conservation.
b. Solar Energy.
c. The Energy Challenge.

Others

a. "Science Activities in Energy".

Tenth Grade thru Twelfth Grade

Annotated Bibliography[1]

Books

Allen, Jack, *American Society*. Chamblee, Ga.: American Book Company, 1978.

This book is on the state adopted list for social studies. Chapter 14, Conserving Resources for All Americans, describes wasteful practices in the past and steps now being taken to correct this pattern. It contains inquiry activities and thought-provoking questions.

Bauer, Nancy W., editor. *Free Enterprise in America*. Atlanta, Ga., Harcourt Brace Jovanovich, 1977.

This is a state adopted text for social studies which discusses economy and environment with suggestions for activities and research.

Branley, Franklyn M. *Solar Energy*. New York: Thomas Y. Crowell Company.

This book presents solar energy discoveries in an enlightening way.

Buggey, JoAnne and Tyler, June. *The Energy Crisis*. Englewood Cliff, N.J.: Prentice-Hall, Inc.

This book is on the state adopted list for social studies, part of the *American Problems Series*. The topics included cover several critical issues, and there are suggested activities for involvement, a bibliography and a film list.

Energy Conservation in the Home - A Curriculum Guide. Oak Ridge, Tenn.: U.S.E.R.D.A., 1977.

The guide was designed for Home Economic teachers as a source of information and provided a synthesis of current energy information from a multitude of sources.

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[1] All available information on resources is included in each reference.

Energy Education Materials Inventory. Portland, Ore.: Energy and Man's Environment, Inc.

This is a 5 volume set with an order number: PB260480.

Games for the Science Classroom.

This publication provides teachers with science and science-related games. Order from:

National Science Teachers Association
1742 Connecticut Ave. N.W.
Washington, D.C. 20009.

Gregory, George Peter. *Environmental Concerns: The Nation*. Atlanta, Ga.: Harcourt Brace Jonanovich, 1977.

This book, state adopted for social studies, contains individual as well as group activities. Students are led to use decision-making processes in evaluating alternative solutions to environmental concerns.

Groner, Alexander. *Waste Now, Want Later*.

Hounshell, Paul B. *Science Games for the Classroom*. 1977.

This is a book of science and science-related games.

Jantzen, Steven. *Scholastic's American Citizenship Program*. Englewood Cliff, N.J.: Scholastic Publications.

This is a state adopted textbook on government. It has an excellent section on protecting the environment through the use of polictical process.

McElroy, William D. *Biology and Man*. Englewood Cliff, N.J.: Prentice-Hall, Inc. 1975.

Myers, Charles B. and Kingsley, Barry. *The Environmental Crisis*. Englewood, N.J.: Prentice-Hall, Inc.

This state adopted book is part of the *American Problems Series*. It is an excellent source of information in the following areas: the nature and causes of the environmental crisis, how people react to the problem, and how we can save the environment. A bibliography is included.

Nuclear Power and the Environment: Questions and Answers.
Hinsdale, Ill.: American Nuclear Society.

This book provides specific information arranged in question and answer format. Charts, tables, graphs, and an extensive bibliography make it a good source.

Ver Steeg, Clarence L. World Cultures. Glenview, Ill.:
Scott, Foreman, and Company.

This book is on the state adopted list for U.S. History. It emphasizes the interdependence of nations in energy and environmental issues.

Pamphlets/Booklets

Aho, Arnold, J. The Role of Brick Masonry in Energy Conservation Design. 1974.

This pamphlet contains excerpts from an address and presents a scientific and practical approach to the use of brick in conserving energy. Order from:

Arnold Aho
School of Design
N.C. State University
Raleigh, N.C.

A Handbook for the Serious (and Not So Serious) Energy Savers.

This pamphlet list over 100 ways to save a little, or a lot, on energy bills. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Anybody Out There Think the Energy Crisis is Over?

This pamphlet, reprinted from the IBM Employees magazine, Think, covers the subjects: "Waste Now, Want Later", "Dollars and Sense", and "Not Bad but Still Not Good Enough". Order from:

International Business Machines Corporation
Armonk, New York 10504.

Award Winning Energy Education Activities for Elementary and High School Teachers.

This booklet includes hand-on experiences, role playing and other learning activities that present such concepts as recycling, domestic vs. imported oil, energy use in school buildings, design on energy-efficient houses, and solar heating and cooling. Order from:

ERDA Technical Information Center
Box 62
Oak Ridge, Tenn. 37830

Blueprint for Large Scale Savings.

This illustrated pamphlet provides standards and specifications for new and existing homes. Order from:

Duke Power Company
P.O. Box 2178
Charlotte, N.C. 28242.

Citizen's Workshop on Energy and the Environment Handbook.
Washington. 1978.

This 32 page booklet contains comprehensive historical information about energy and the current energy situation. Order from:

Office of Public Affairs
U.S. Department of Energy
Washington, D.C. 20585.

Energy Conservation Experiments.

This booklet contains eleven experiments designed to show how energy is wasted and how to save energy. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Energy Conservation, Experiments You Can Do.

This booklet suggest experiments which can be done by the students from grades 4-12. Seven additional booklets of this nature on various related topics may be obtained free of charge. Order from:

Thomas Alvo Edison Foundation
Cambridge Office Plaza, Suite 143
18280 West Ten Mile Road
Southfield, Michigan 18280

Energy, Economics and Environment.

This pamphlet describes an in-service education program for teachers to foster a better understanding of the world's energy dilemma. Order from:

Carolina Power and Light
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

Energy in the Global Marketplace. Oak Ridge, Tennessee: U.S. Department of Energy.

This booklet explains why some countries use more energy than others and includes a simulation game.

Energy Management 78.

This pamphlet describes residential, commerical, industrial, and governmental services for it's customers. Order from:

Carolina Power and Light
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

Energy Policy Statement.

This pamphlet argues that the U.S. should strive to produce 90% of its energy and urges the federal government to make recommendations. Order from:

Gulf Oil Company
Gulf Building
Pittsburgh, Pa. 15230.

Energy - Why We Must Conserve It Now?

This comic book illustrates the need for conserving energy. Order from:

Carolina Power and Light Company
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

Environmental Education: Problems, Projects, and Exercises.

This booklet is a helpful source of activities for students in grades 4-10. Order from:

Division of Science Education
N.C. Department of Public Instruction
Raleigh, N.C. 27611.

Environmental Education: Strategies for Wise Use of Energy.

This booklet is designed for all levels and activities are grouped by levels. The appendix contains various items such as checklists, charts, a glossary and a list of readings and films for educators. Order from:
Division of Science Education
N.C. Department of Public Instruction
Raleigh, N.C. 27611

Factsheets. ERDA.

These pamphlets, approximately four pages long, include general and specific information as well as a list of references. One copy of nineteen different ones are free from:
ERDA - Technical Information Center
Box 62
Oak Ridge, Tenn. 37830.

Fossil Fuel - Oil. ERDA.

This booklet covers the history of the use of oil and some of the new technologies and methods that may be used in oil production in the future. Order from:
ERDA - Technical Information Center
Box 62
Oak Ridge, Tenn. 37830.

Home Energy Conservation Checklist.

This is a one page checklist. Order from:
Carolina Power and Light Company
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

How a Bill Becomes a Law to Conserve Energy.

This booklet lays out the procedure used by politicians to develop and submit a bill for consideration in a state legislature or in Congress. In this particular booklet, facts about energy, environment, and economics are drawn together in the preparation of a bill. Activities included are appropriate for classes in U.S. History, government, civics, science and math. Obtain free from:
U.S. Department of Energy
Technical Information Office
P.O. Box 62
Oak Ridge, Tenn. 37830.

How to Read Your Electric Meter.

This card explains how to read an electric meter and then determine the KWH usage. Order from:

Carolina Power and Light Company
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

How to Save on Your Electric Bill.

This pamphlet gives tips for saving energy in the home. Order from:

Carolina Power and Light Company
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

Let's Stop Tilting at Windmills.

This publication reviews the basic facts about energy and the economy of the United States. Graphs, actual dollar costs, and percentage comparisons are used as illustrations. Order from:

General American Atomic Company
P.O. Box 81608
San Diego, California 92138.

More or Less: Education for Future Designs - Module #4 - The Environment. Chapel Hill, N.C. Carolina Population Center, 1977.

This booklet discusses environment, intereactions between man and his resources, population, and roles played by the United States and the world in trying to curb the nation's appetite for energy.

North Carolina Project Conserve Energy Blanket Questionaire.

This is a questionaire from which information about the home can be used to develop recommendations about improvements that will make it more energy efficient. Order from:

North Carolina Department of Commerce
Energy Division
P.O. Box 26088
Raleigh, N.C. 27611.

Ocean Thermal Energy Conservation.
Order from:
Technical Information Center
Box 62
Oak Ridge, Tenn. 37830.

104 Ways to Control Your Electric Bill.

This booklet list ways for reducing electrical bills. Order from:
Edison Electric Institute for Electric Co's.
90 Park Ave.
New York, New York 10016.

Our Energy-Problems and Solutions.

This booklet contains factual information on energy conservation in the home, on the farm, and in industry. Order from:
Energy Conservation Research
9 Birch Road
Malvern, Pa. 19355.

Passive Design Ideas for the Energy Conscious Consumer.

This is a report giving ideas on how to build or remodel homes to make them more energy efficient. Order from:
National Solar Heating and Cooling
Information Center
P.O. Box 1607
Rockville, Md. 20850.

Saving Energy at Home, Modules 1-8.

These eight pamphlets give illustrated ideas for home energy conservation. Order from:
Department of Community Colleges
Program Development Center
Raleigh, N.C.

Solar Energy.

In this booklet one can see how and why solar energy is the way of the future, for it covers some past, present and future uses. Order from:
ERDA - Technical Information Center
Box 62
Oak Ridge, Tenn. 37830.

The Common Sense Home.

This pamphlet gives sensible, energy-conscious construction recommendations. Order from:

Carolina Power and Light Company
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

The Energy Challenge.

This booklet contains 24 spirit duplicating activity masters and the teacher's guide for six units pertaining to conservation of energy. Free single copies available from:

Federal Energy Administration
Washington, D.C. 20461.

The Heat Pump.

This is a six page booklet explaining what a heat pump is, what it does and how. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Tips for Energy Savers.

This pamphlet provides tips for saving energy around the home, on the road, and in the marketplace. Order from:

ERDA - Energy Conservation Now
Pueblo, Colorado 81009.

U.S. Energy Policy - Which Direction?

Six lessons are covered in this unit of study, with excellent use of graphs and charts. Order from:

U.S. Department of Energy
P.O. Box 62
Oak Ridge, Tenn. 37830.

What Everyone Should Know About Electric Safety.

This comic book discusses safety in the wiring of homes, the safe use of fuses, circuit breakers, electric appliances, power tools, and outside equipment. It also advises what to do in case of an electrical emergency. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

What Have You Bought When You Pay Your Monthly Electric Bill?

This booklet discusses kilowatt-hours, identifies the large KWH users and explains how to read meters and electric bills. Order from:

Carolina Power and Light Company
Box 1551, Central Plaza Building
Raleigh, N.C. 27602.

When It Comes to Conserving Energy, Brick Makes the Difference.

This is a pamphlet explaining how brick offers significant advantages in conserving energy. Order from:

Brick Institute of America
1750 Old Meadow Road
McClean, Va. 22101.

Your Electric Meter: The Story in a Nutshell.

This pamphlet explains how to read an electric meter, gives estimated usage of appliances and provides tips for electrical economy. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Periodicals:

Conservation News. National Wildlife Federation.

This brief news bulletin, published bimonthly, with articles that may be reprinted without permission, is available at no charge. Order from:

Educational Servicing
National Wildlife Federation
1412 16th Street
Washington, D.C. 20036.

"High Prices Reduce Household Energy Use". Carolina Country, Vol. 9, No. 2 (February, 1977).

This article is based on information from surveys conducted by the Economic Research Service of the U.S. Department of Agriculture.

The Energy Conserver. N.C. Department of Public Instruction, Division of Science.

This quarterly bulletin contains information on pamphlets, films and other resource material for teachers and/or students. There are "Energy Mini-lessons", news of energy education conferences and workshops, and other activities included.

"Urban Composting: A New Approach to an Old Practice". Horticulture (July, 1978).

This article stresses the point that city waste, properly managed, is a renewable resource.

"Use Warm Season to Insulate". Carolina Country, Vol. 9, No. 8 (August, 1977).

This article gives ideas for increasing the energy efficiency of the home.

Games

Canipe, Stephen I. Crisis Game.

This easy to play game attempts to do two things: present a vocabulary of terms commonly heard in energy discussions and provide immediate use and reinforcement of those terms in a low-risk game situation. Available free from:

Ann Watkins
Science Division, S.D.P.I.
Room 284, Education Building
Raleigh, N.C. 27611.

D'Arruda, Jose. Energy-Environment Simulator.

Using an analog computer which simulates the real world, students can manipulate energy sources and realize the effects of various decisions as time passes at a rate of 100 years a minute. Order from:

Dr. Jose D'Arruda
Department of Education
Pembroke State University
Pembroke, N.C. 27264.

Thomas, H. Collins. First Things First: An Allocation of Resources Exercise.

This is a game in which students make decisions on the use of money in a Five Year Development Plan for their nation. Copies may be obtained by writing to:

H. Thomas Collins
National Education Association
New York, New York.

Filmstrips

Young Scientists Investigate Pollution. SVE Educational Filmstrips, Inc. (4 filmstrips, 2 cassettes, guides).

The topic covered in this set of filmstrips are: "Smog and Plant Growth", "Air Pollution and Lung Tissue", "Fresh Water from the Sea", and "Measuring Water Pollution". The filmstrips are on the intermediate level, but may be used in general biology.

Films

Bridge to Tomorrow. Duke Power Company

This film reconstructs the significant historic chronology of energy development to show the importance of energy to society. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Joey's World. Duke Power Company.

By looking at the future world, the film strips explores both the energy demands and the energy supply for the world. Order from:

Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Seeking and Conserving Mineral Resources. Duke Power Company. (color, 13 min.)

This film probes efforts to develop resources while preserving

the ecosystem. Order from:
Duke Power Company
Educational Services
P.O. Box 2178
Charlotte, N.C. 28242.

Slides

The Energy Crisis. Educational Design, Inc. (160 Slides, 2 LP records or 2 cassettes, teacher's guide).

This slide program explains where fuel comes from, how we use it and why the supply is running low. Controversial positions represent the view points of industrialists, scienctist, ecologist, and diplomats.

Others

"Science Activities in Energy". Oak Ridge. American Museum of Atomic Energy.

This packet contains four folders with activities related to solar, chemical, and electrical energy and conservation. Order from:
American Museum of Atomic Energy
Oak Ridge, Tenn.

ADDITIONAL INFORMATION SOURCES

Additional Information Sources

The organizations listed below have available materials that may be used in the various disciplines. Anyone wishing to inquire about the materials may do so by contacting the organizations.

"Alternative Energy Sources"
Route 1 Box 36-B
Minong, Wi. 54859

Alyeska Pipeline Service Co.
P.O. Box 576
Bellevue, Wash. 98009

Amaco Public Affairs
East-South Area Office
P.O. Box 5077
Atlanta, Ga. 30302

American Action Foundation
Suite 732
Dupont Circle Building
Washington, D.C. 20036

American Association for the
Advancement of Science
1515 Massachusetts Ave., N.W.
Washington, D.C. 20005

American Automobile Assoc.
Carolina Motor Club
P.O. Box 60
Charlotte, N.C. 28230
704/376-7511

American Gas Association
Arlington, Va. 22210
703/524-2000

American Nuclear Society
244 East Ogden Ave.
Hinsdale, Ill. 60521

American Petroleum Institute
1801 K Street, N.W.
Washington, D.C. 20006

Amoco
P.O. Box 5077
Atlanta, Ga. 30320

Atlantic Richfield Company
ARCO Plaza
515 S. Flower Street
Los Angeles, California 90071

Atomic Energy Commission
Washington, D.C. 20545

Ballantine Books, Inc.
101 5th Ave.
New York, N.Y. 10003

Braziller, George Inc.
1 Park Ave.
New York, N.Y. 10016

California Tomorrow
Monadrock Building
681 Market Street
San Francisco, Calif. 91405

CP&L - Carolina Power & Light Co.
Educational Division
Box 1551, Central Plaza
Raleigh, N.C. 27601

CATALYST
274 Madison Ave.
New York, N.Y. 10016

Center for Cassette Studies, Inc.
8110 Webb Ave.
North Hollywood, Calif. 91605

The Center for Population and
Environmental Education
School of Education
University of North Carolina
Chapel Hill, N.C. 27514

Center for Strategic and
International Studies
1800 K Street, N.W.
Washington, D.C. 20006

Center for the Study of
Democratic Institutions
P.O. Box 4446
Santa Barbara, Calif. 93103

Chase Manhattan Bank
1 Chase Manhattan Plaza
New York, N.Y. 10015

Citizens Energy Council
Allendale
N.J. 07401
(Monthly Newsletter: "Nuclear
Opponents")

Committee for Nuclear
Responsibilities, Inc.
P.O. Box 2329
Dublin, Calif. 94566

Common Cause
2030 M Street, N.W.
Washington, D.C. 20036

Congressional Quarterly, Inc.
1735 K. Street, N.W.
Washington, D.C. 20006

Conservation Council of N.C.
P.O. Box 553
Carrboro, N.C. 27510

The Conservation Foundation
1717 Massachusetts Ave., N.W.
Washington, D.C. 20036

Consumer Action Now
30 East 68th Street
New York, N.Y. 10021

Cooperative Science Education
Center, Inc.
156 Adams Lane
Oak Ridge, Tenn. 37830

Crown Publications, Inc.
50-10 34th Street
Long Island City, N.Y. 11101

Doubleday and Co., Inc.
501 Franklin Ave.
Garden City, N.Y. 11530

Duke Power Co.
Educational Services
P.O. Box 2178
Charlotte, N.C. 28201
ATTN: Joseph J. Maher

ECO-NEWS
Environmental Action Coalition
235 E. 49th Street
New York, N.Y. 10017

ECOS
P.O. Box
Chapel Hill, N.C.

Educational Foundation/Nuclear
Science
24 E. 58th Street
Chicago, Ill 60651

EEG/EAG
1543 N. Martel Ave.
Los Angeles, Calif. 90046
(Very good wall chart: "Energy
Options for the Future")

Electric Energy Association
90 Park Ave.
New York, N.Y. 10016

Electrical Industries Assoc.
6055 East Washington Blvd.
Los Angeles, Calif. 90040

Energy Center
309 Weil Hall
University of Florida
Gainsville, Fla. 32611

North Carolina Department of Commerce
Energy Division
P.O. Box 25249
Raleigh, N.C. 27611
919/733-2230

Energy Information Center
Conference Board
845 Third Ave.
New York, N.Y. 10022

"Energy Management"
Commerce Clearing House, Inc.
4025 W. Peterson Ave.
Chicago, Ill. 60646
(Weekly Newsletter)

"Energy Report"
1239 National Press Bldg.
Washington, D.C. 20004
(Weekly Newsletter)

"Energy Today"
See Trends Publishing, Inc.

Enviro/Info
P.O. Box 115
Green Bay, Wi. 54305

Environmental Action Bulletin
33 E. Minor Street
Emmaus, Pa. 18049

Environmental Action Reprint Ser.
University of Colorado
1100 14th Street
Denver, Colo. 80202
(Catalog of articles & bumper
stickers on nuclear power and
solar energy)

Environmental Educational Report
1621 Connecticut Ave. N.W.
Washington, D.C. 20009
(Monthly newsletter)

Environment Information Center, Inc.
124 East 39th Street
New York, N.Y. 10016

EPA - Environmental Protection Agency
Washington, D.C. 20460

Eugene Future Power Committee
P.O. Box 5274
Eugene, Ore. 97405

Exxon Company, USA
Public Affairs Dept.
P.O. Box 2180
Houston, Texas

FEO - National Energy Information
Center
Room 4508
U.S. Post Office Building
Benjamin Franklin Station
Washington, D.C. 20461

Ford Foundation
Energy Policy Project
P.O. Box 23212
Washington, D.C. 20024
or
1776 Massachusetts Ave., N.W.
Washington, D.C. 20036

Freeman, W.H. & Co.
660 Market Street
San Francisco, Calif. 94104

Friends of the Earth
529 Commercial Street
San Francisco, Calif. 94111

Great Plains National Instructional
T.V. Library
P.O. Box 80669
Lincoln, Neb. 68501

Hackett Publishing Co.
4047 N. Pennsylvania Street
Indianapolis, Ind. 46205
(Reprints on past energy related
articles from Environment - 35¢/copy)

Harper & Row Publishers, Inc.
49 E. 33 Street
New York, N.Y. 10016

Home Ventilating Institute
230 N. Michigan Ave.
Chicago, Ill 60601

Independent Citizens Research
Foundation for the Study of Degenerate
Diseases, Inc.
P.O. Box 97
Ardsley, N.Y. 10502

International Assoc. for Advancement
of Earth & Environmental Science
Dept of Earth Science
Northeastern Illinois Univ.
Bryn Mawr at St. Louis Aves.
Chicago, Ill. 60659

The Johns Hopkins Press
Baltimore, Md. 21218

Learning
1255 Portland Place
Boulder, Colo. 80302

Lippincott, J.B., Co.
E. Washington Square
Philadelphia, Pa. 19105

Little Brown & Co.
34 Beacon Street
Boston, Mass. 02106

Lyceum Productions, Inc.
P.O. Box 1226
Laguna Beach, Calif. 92652

McDougal, Littell & Co.
P.O. Box 1667
Evanston, Ill. 60204

Messner
(see Simon & Schuster)

"Mother Earth News"
P.O. Box 70
Hendersonville, N.C. 28739

National Audubon Society
950 Third Ave.
New York, N.Y. 10022

Natural History Press
(see Doubleday & Co., Inc.)

National Intervenors
153 E. Street, S.E.
Washington, D.C. 20003

National Mineral Wool Insulation
Association, Inc.
211 East 51st Street
New York, N.Y. 10022

National Science Foundation
Washington, D.C. 20550

National Science Teacher Association
1742 Connecticut Ave. N.W.
Washington, D.C. 20009

N.C. Dept of Transportation
Public Relations
Raleigh, N.C. 27611
919/829-2520

N.C. Energy Information Program
P.O. Box 5125
North Carolina State University
Raleigh, N.C. 27607
919/737-3211

N.C. Oil Jobbers Association
P.O. Box 30166
Raleigh, N.C. 27612
919/782-4411

N.C. Petroleum Council
P.O. Box 167
Raleigh, N.C. 27602
(1210 Branch Bank Building)
919/828-5438

N.C. State Energy Office
215 E. Lane Street
Raleigh, N.C.

Oak Ridge Associated Universities
Oak Ridge, Tenn. 37830

Office of Economic Opporunity
Atlanta Regional Office
730 Peachtree Street
Atlanta, Ga. 30308

Owens/Corning Fiberglass
P.O. Box 19537
Raleigh, N.C. 27609
919/872-0823

Pantheon Books
201 E. 50th Street
New York, N.Y. 10022

The Philadelphia Inquirer
Philadelphia Newspapers, Inc.
400 N. Broad Street
Philadelphia, Penn. 19101

Population Reference Bureau
1755 Mass. Ave. N.W.
Washington, D.C. 20036

Project CLEAN
7235 Antioch
Shawnee Mission, Kansas 66204

Randon House, Inc.
201 E. 50th Street
New York, N.Y. 10022

Rodale's Environmental Action Bulletin
33 E. Minor Street
Emmaus, Penn. 18049
(Good monthly newsletter)

School of Engineering
NCSU
Raleigh, N.C. 27607
919/737-2312

Science (Magazine) AAAS
1515 Massachusetts Ave., N.W.
Washington, D.C. 20005

Scientist's Institute for Public Information
30 E. 68th Street
New York, N.Y. 10021

Sierra Club Books
Box 7959
San Francisco, Calif. 94120

Simon & Schuster, Inc.
630 Fifth Ave.
New York, N.Y. 10020

Solar Energy Digest
P.O. Box 17776
San Diego, Calif. 92117

Solar Energy Panel
Dept. of Mechanical Engineering
University of Maryland
College Park, Md. 20742

Southern Interstate Nuclear Bd.
Ken Nemeth
9 Dunwiddie Park
Atlanta, Ga.

Standard Oil of California
225 Bush Street
San Francisco, Calif. 94104

Standard Oil Company
200 E. Randolph Drive
Chicago, Ill. 60601

Sun Oil Company
1608 Walnut Street
Philadelphia, Penn 19103
ATTN: Public Relations

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Task Force on Nuclear Pollution
305 High Street
Moorestown, N.J. 08057

Technology Review
Mass. Institute of Technology (MIT)
Room E19-430
Cambridge, Mass. 02139

Texaco, Inc.
135 E. 42nd Street
New York, N.Y. 10017

Time, Inc.
541 N. Fairbanks Court
Chicago, Ill. 60611
(TIME AND FORTUNE)

Toledo Public Schools
Environmental Education Program
Manhattan & Elm
Toledo, Ohio 43608

Trends Publishing, Inc.
National Press Building
Washington, D.C. 20004
(Bi-weekly newsletter ""Energy Today")

U.S. Department of Commerce
Greensboro Field Office
P.O. Box 1950
Greensboro, N.C. 27402
919/273-8234

U.S. Department of Energy
Office of Public Affairs
Washington, D.C. 20461

U.S. Department of Energy
1655 Peachtree Street, N.E.
Atlanta, Ga. 30309
404/881-2062

U.S. General Accounting Office
Room 6417
441 G Street, N.W.
Washington, D.C. 20548
(Government Report)

VEPCO - Virginia Power & Light Co.
Roanoke Rapids, N.C. 27870

Vermont Tomorrow
5 State Street
Montpelier, Vt. 05602

Vintage
See Randon House, Inc.

Viking Press, Inc.
625 Madison Ave.
New York, N.Y. 10022

Wake Environment
3039 Medlin Drive
Raleigh, N.C.

Walt Disney Educational
  Materials Co.
800 Sonora Ave.
Glendale, Calif. 91201

Watts, Franklin, Inc.
575 Lexington Ave.
New York, N.Y. 10022

Westinghouse Electric Corp.
Power System
Box 355
Pittsburg, Penn. 15230

Wiley, John & Sons, Inc.
605 Third Ave.
New York, N.Y. 10016

Winston Press
25 Groveland Terrace
Minneapolis, Minn. 55403

World Future Society
4916 St. Elmo Ave. (Bethesada)
Washington, D.C. 20014

APPENDICES

APPENDIX A.

Field Trip Possibilities

FIELD TRIP POSSIBILITIES

I. Old Salem

A. Contact Person:
Mr. Gene Capps
Drawer F, Salem Station
Winston Salem, N. C. 27108
Phone: 723-3688 (call at least 24 hours in advance)

B. Instructional Concepts:

1. We can compare a community's sources of energy in the 18th century with that of the 19th century.
2. The conservation of available resources is as important today as it was in the past.

C. Teaching Recommendations:

1. Lectures/demonstrations, thematic tours, hands-on workshops, and slide presentations are available through the site.
2. This field trip is suitable for grades K-12.

II. A & T State University

A. Contact Persons:
Dr. Ward Collins and Dr. Stefanakos
Cherry Hall
A & T State University
Greensboro, N. C.
Phone: 279-7762

B. Instructional Concepts:

1. Solar energy can be converted into electrical energy.
2. Solar thermal energy can be converted into solar heat.

C. Teaching Recommendations:

1. Students would benefit most from these persons by visiting the University where they would have the opportunity to see the various research experiments in the laboratory. However, these persons are available for lecture/demonstrations at schools, and materials will be sent on request.
2. Grades K-6 would find a tour of the Home Economics Cottages and the greenhouse, both using solar heat, interesting. Grades 7-12 should tour Rockwell Solid State Electronics laboratory to see the research being done on solar cells.

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III. Sunovations

A. Contact Person:
Mr. Charles Eakes
2800 Cromwell Road
Greensboro, N. C. 27407
Phone: 299-6267

B. Instructional Concepts:
1. The use of solar energy equipment helps to conserve other forms of energy.
2. Solar energy equipment developed to date includes cookers, water heaters, and solar panels.
3. Wood-burning fireplaces and stoves with water heat recovery attachments are efficient.

C. Teaching Recommendations:
1. Small-group field trips to location is possible.
2. A mobile unit can be displayed at shopping centers or cluster of schools for public viewing.
3. Slide-tape presentations on "Energy Crisis" is available.
4. This trip is geared toward secondary school students.

IV. Fire Department

A. Contact Person:
Capt. A. B. Kimel
Fire Station #8
High Point Road
Greensboro, NC
Phone: 292-1262

B. Instructional Concepts:
1. The proper building of homes requires energy efficient construction.
2. Safety checks will help to reduce operational cost.

C. Teaching Recommendations:
1. Home audits are conducted to see if the homes are "Energy Efficient Structures."
2. Using the home audits, Duke Power makes recommendations to the owners for improving energy efficiency.
3. Greensboro Fire Department can provide resource people to speak to classes.
4. This activity is suitable for students of all age groups and for teachers.

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V. Home Building Association of Greensboro and High Point

A. Contact Person:
Ms. Ruth Penny
P.O. Box 5364
Greensboro, N. C. 27403
Phone: 274-6357

B. Instructional Concepts:
1. Energy conservation in the construction of the home is important.
2. Constructing a home that is energy efficient will save operational cost.

C. Teaching Recommendations:
1. Visit home building site to see different stages of construction. The best time for field trips would probably be Friday afternoon. Students should be well supervised and warned of boards with nails, holes in the ground, etc. Most builders would want to be relieved of the responsibility of accidents. Ms. Penny can suggest energy efficient homes to visit.

VI. Sun Solar Systems

A. Contact Person:
Mr. Odell Payne
1600 E. Wendover Ave.
Greensboro, N.C. 27405
Phone: 272-1513

B. Instructional Concepts:
1. Solar systems and their potential application are important in energy conservation.
2. Equipment for solar energy is being developed and improved making it a viable energy source for the future.

C. Teaching Recommendations:
1. This is an excellent culminating activity for secondary students who have studied solar energy.
2. The mobile unit and slide presentation that is available to schools is as valuable as a trip to Sun Solar Systems is.
3. Teacher literature is available.

VII. Colonial Pipeline

A. Contact Persons:
Mr. Ralph E. Johnson or Mr. Euel Whittaker
Galimore Dairy Road
P.O. Box 11297
Greensboro, NC 27409
Phone: 292-0426

B. Instructional Concepts:
1. In choosing the method of transportating petroleum products, potential hazards to the environmental must be considered.
2. Vast technological advances, which help conserve energy, have been made in the past 25 years through extensive use of computers.

C. Teaching Recommendations:
1. Colonial Pipeline would be an excellent reference for secondary students involved in special projects or research related to conservation methods used in the technology of fuel transportation.
2. Small groups (10-12) can be best accommodated.
3. Additional information may be obtained by contacting:
Mr. Will Nicoll, Employee Relations
3390 Peachtree Road, N.E.
P.O. Box 18855, Atlanta, Ga. 30326

VIII. Duke Power Station (Belews Creek)

A. Contact Person:
Mr. Joe Howard
Greensboro, N. C.
Phone: 378-9421

B. Instructional Concepts:
1. Coal is used to produce electricity.
2. Machines, computers, and people work together to produce electricity.

C. Teaching Recommendations:
1. Familiarity with vocabulary related to electricity is a prerequisite to a field trip.
2. Knowledge of methods of transporting coal will help students understand how the plant operates.
3. This is an excellent field trip for prepared secondary students. The tour is 1½ - 2 hours long, including a slide presentation.
4. Two week notice and groups of 40 students or less are requested. The student should wear comfortable clothing and walking shoes.
5. Pamphlets with a map of the steam station are available on request.

IX. Duke Power - "Operations Center"

A. Contact Person:
Mr. Joe Thomas
Fairfax and Hilltop Road
Greensboro, N. C.
Phone: 292-8775

B. Instructional Concepts:
1. Electrical utilities must be able to provide high and low consumption.
2. Providing electricity is a complex business.
3. The amount of electricity used determines how much the consumer pays.

C. Teaching Recommendations:
1. Resource persons, audio-visual, materials and publications are available upon request.
2. The Operations Center tour will help students learn how equipment is maintained and checked for accuracy.
3. Home Economists are available for teaching individual class/groups.

X. High Point Environmental Center

A. Contact Person:
Ms. Sally Hedrix
Penny Road
Route 1 Box 401
High Point, N. C.
Phone: 454-4214

B. Instructional Concepts:
1. The Environmental Center will develop a program around concepts which are requested.

C. Teaching Recommendations:
1. Resources available for loan:
   a. Color slides/tape program on Solar Energy, Ready When You Are
   b. Filmstrips on energy.
2. Teachers may request that conservation programs be developed on their grade levels, K-12.

XI. Meredith Pools

A. Contact Person:
Mr. Cruise Lewis
116 Stage Coach Trail
Greensboro, N. C.
Phone: 299-7044

B. Instructional Concepts:
1. Using solar energy for heating and cooling is a means of conserving other forms of energy.
2. The availability and vast supply of solar energy makes it an important one.

C. Teaching Recommendations:
1. Meredith Pools is not set up to accommodate class-size field trips due to their limited space and number of employees. Teachers or small groups of students should visit for information on solar energy.
2. Dr. Maurice T. Raiford, Greensboro, is a solar energy consultant who is suitable for secondary students.

XII. Greensboro Energy Commission

A. Contact Person:
Mr. Harvey Phipps
Room 315, City Hall
Washington and Greene Street
Greensboro, N.C.
Phone: 373-2065

B. Instructional Concepts:
1. Efficient use of energy in large, public buildings (specifically, city-owned buildings) is important.
2. Various methods are employed for making city-owned buildings energy efficient.

C. Teaching Recommendations:
1. Field trips can be arranged to any of the buildings(5) in which the city has emphasized energy efficiency. Little prior preparation is needed.
2. Materials on efficient use of energy (pamphlets, films) may be borrowed from the Public Information Center (1st floor, Municpal Building).
3. These activities and materials are recommended for students in grades K-12.

XIII. Greensboro Coliseum

A. Contact Person:
Mr. Steve Payseur
1912 West Lee Street
Greensboro, N. C.
Phone: 294-2140

B. Instructional Concepts:
1. Energy can be conserved in both heating and cooling.
2. Cooling requires more energy than heating.

C. Teaching Recommendations:
1. Students should be prepared for the visit by discussing the operation of the large buildings.
2. Vocabulary unique to this type of plant operation should be learned (such as boilers, compressors, electrostatics, freon, ammonia, etc.), so students will understand the principles.
3. This field trip would be interesting for secondary students.

XIV. NCSU, Burlington Engineering Laboratory

A. Contact Person:
Dr. Thomas S. Elleman
North Carolina State University
Box 5636 NCSU
Raleigh, N. C. 27650
Phone: 919/737-2301
919/737-2302

B. Instructional Concepts:
1. The use of nuclear fuel must be carefully considered from many viewpoints.
2. The nuclear reactor produces electricity by turning water to steam.

C. Teaching recommendations:
1. Tours of this facility are suitable for chemistry, physics and science clubs.
2. These tours will have to be conducted during the normal work week, Monday through Friday.
3. Students need a basic understanding of nuclear energy prior to the visit.

XV. Using the School Plant as a Learning Lab

A. Instructional Concepts:

1. Being aware of various school plant facilities is essential for efficient operation.
2. Management of energy in the school plant is important.
3. Attitudes of all school personnel is a significant factor.

B. Teaching Recommendations:

1. Arrange for faculty to meet with a representative from the County Office (or use the school custodian if he is qualified) so he can explain how the local school heating-cooling system works.
2. Arrange for a representative from the County Office (or the power company) to explain to the faculty about school electric rates (more is not cheaper as in home rates).
3. Teach the class how to read an electric meter, then let them keep a chart of the school's meter for a number of days. Compare the amounts used over a period of days.
4. Have a student prepare a schema of the heating system components. Discuss the purpose of each component.
5. Check the temperature on the inside and the outside of a classroom wall. Compare it to the temperature inside and outside a window pane for discussion of heat transfer through different materials.
6. Compare the temperature in the classroom near an unshaded window to the temperature near a window with the blind closed.
7. Compare the temperature at a set distance from an unobstructed radiator to the temperature when a piece of furniture is obstructing the radiator.
8. Use smoke to show warm air flow from unobstructed radiator as compared with obstructed (as in 7 above).
9. Note the setting of each thermostat in the school, then use a thermometer to check the accuracy of each. Does a 65 degree setting show that the room is really at 65 degrees?

APPENDIX B

Energy Use Checklist

Energy Use Checklist

Parents,

For you and your child to become more aware of energy uses in your home, please read, discuss, and complete this checklist with your child and send it back to school. Thank you.

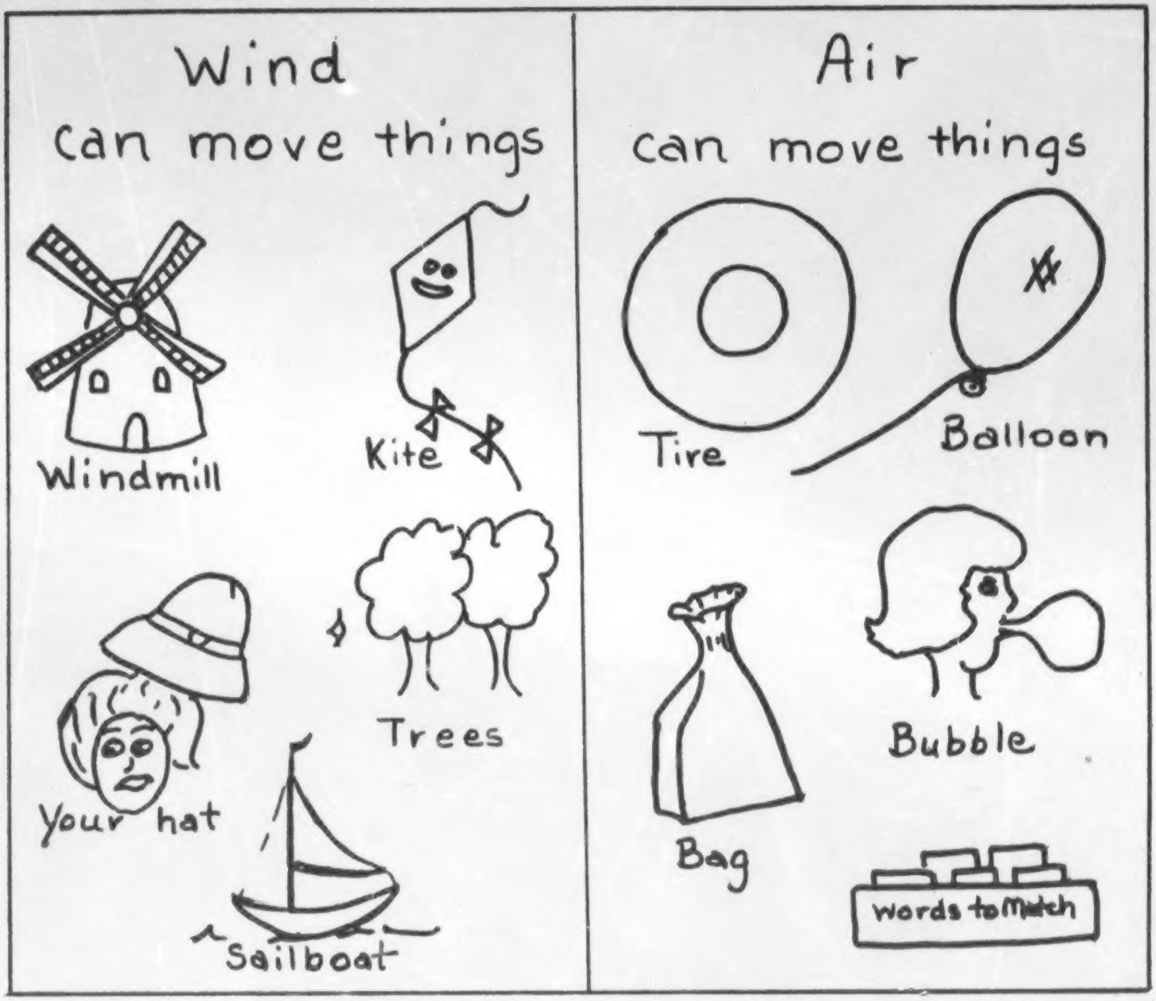
Yes	No	Questions
		Do you have a car/or truck? How many?
		Do you have a motor boat?
		Do you have a fireplace?
		Do you use a woodstove?
		Do you use gas heat?
		Do you use electric heat?
		Do you use oil heat?
		Is your home total-electric?
		Is your home air-conditioned?
		Do you have a clothes dryer?
		Do you have a clothes washer?
		Do you wash most clothes in cold water?
		Do you have a frost-free refrigerator?
		Do you set your thermostat at 65 or lower?
		Does your child ride the school bus?
		Do you use a dishwasher?
		Do you use a microwave oven?
		Is your hot water heater set above 140 degrees?
		Does your home have storm windows and doors?
		Do you watch T.V. more than 2 hours a day?
		Do you close drapes or blinds to the cold air in winter and to the hot sun in summer?
		Do you turn things off when not in use? (lights, T.V.)

APPENDIX C

Illustrations

K-3 Concept # 1, Activity w

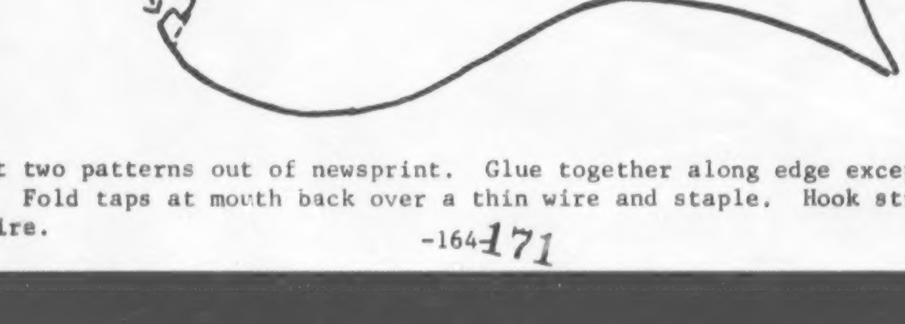
(1)


Wind
can move things
Windmill
Kite
Trees
your hat
Sailboat
Air
can move things
Tire
Balloon
Bubble
Bag
words to Match

Make a bulletin board with these or your own ideas and a labeled pocket under each object. Children improve letter and word matching skills, learn to read new words, and focus their attention on these basic concepts by matching words from the pocket with the appropriate picture.

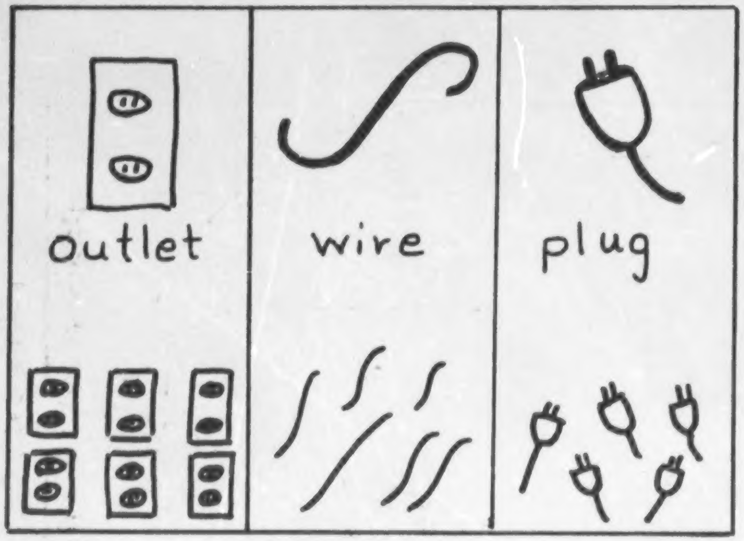
K-3 Concept # 2, Activity e

(2)



FISH
KITE

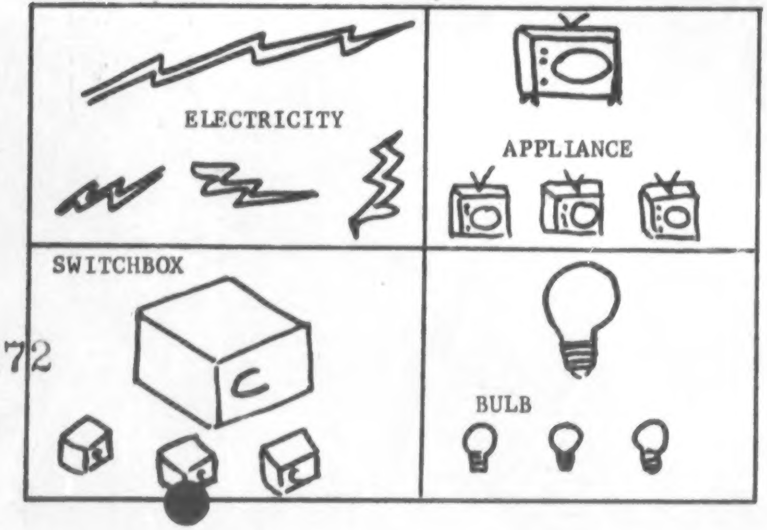
Cut two patterns out of newsprint. Glue together along edge except at mouth. Fold taps at mouth back over a thin wire and staple. Hook string onto wire.


outlet
wire
plug

Word and picture match

wire	plug	outlet

Charts from which to choose small pictures.

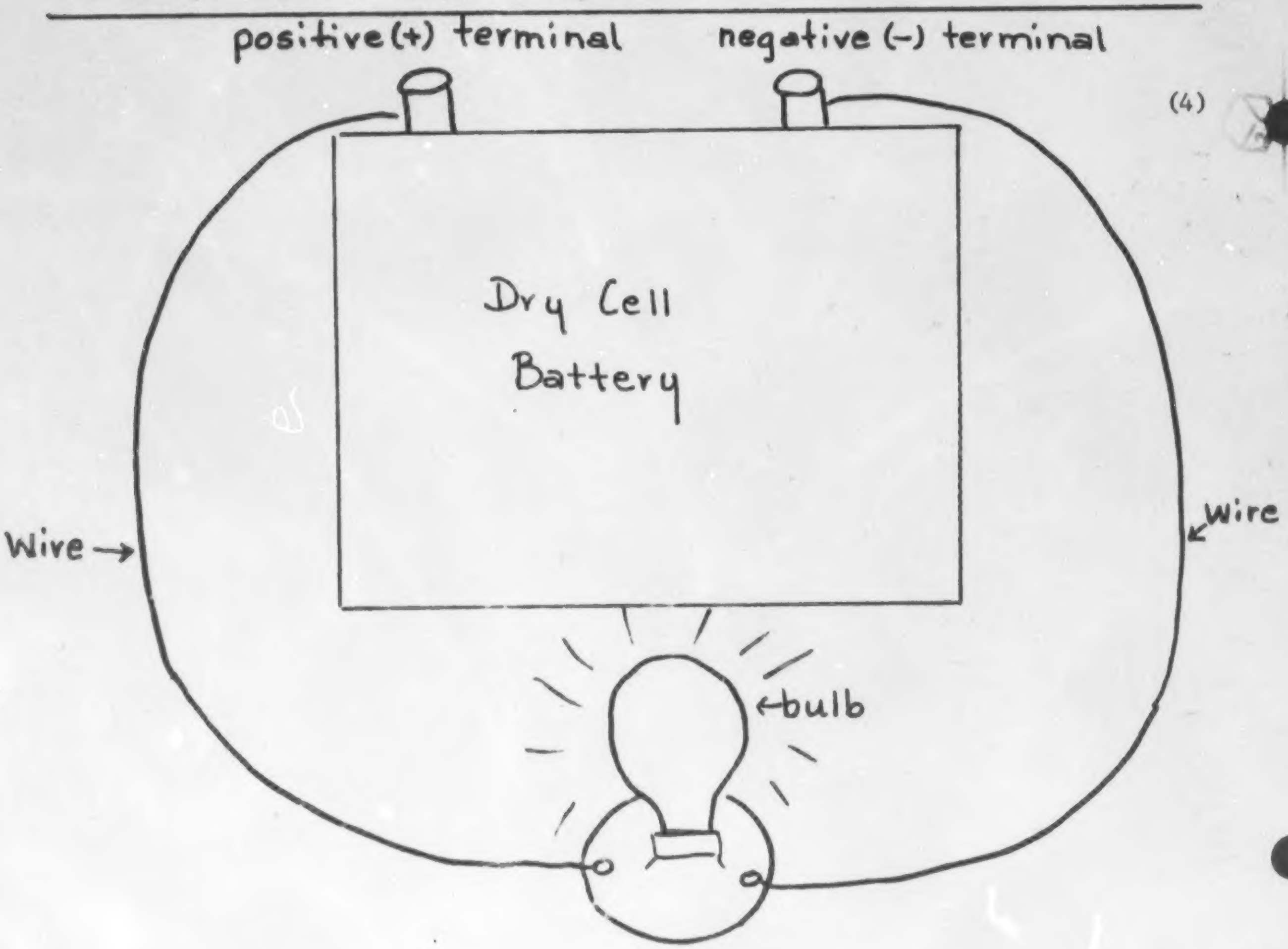

ELECTRICITY
APPLIANCE
SWITCHBOX
BULB

Child's worksheet with spaces for pasting pictures.

BULB	SWITCHBOX	ELECTRICITY

K-3 Concept # 6, First Grade Activity b

(4)

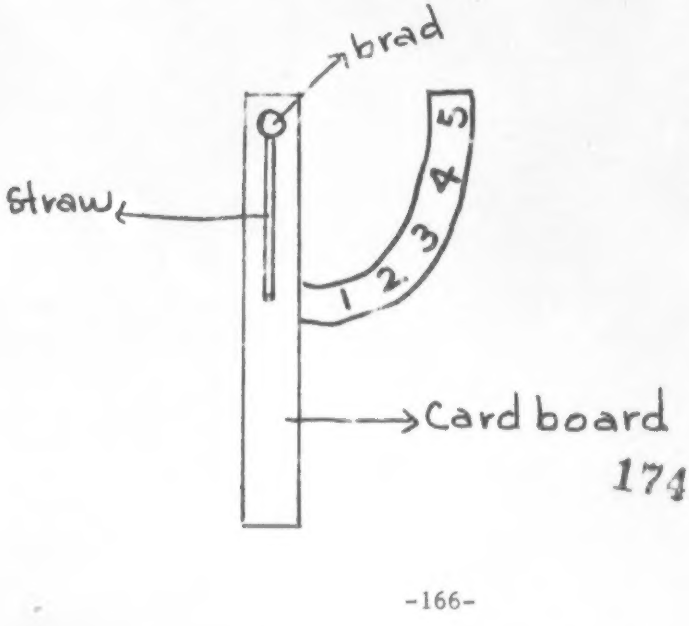

positive(+) terminal
negative (-) terminal
Dry Cell Battery
Wire
wire
bulb

Series Circuit

K-3 Concept # 2, First Grade Activity t

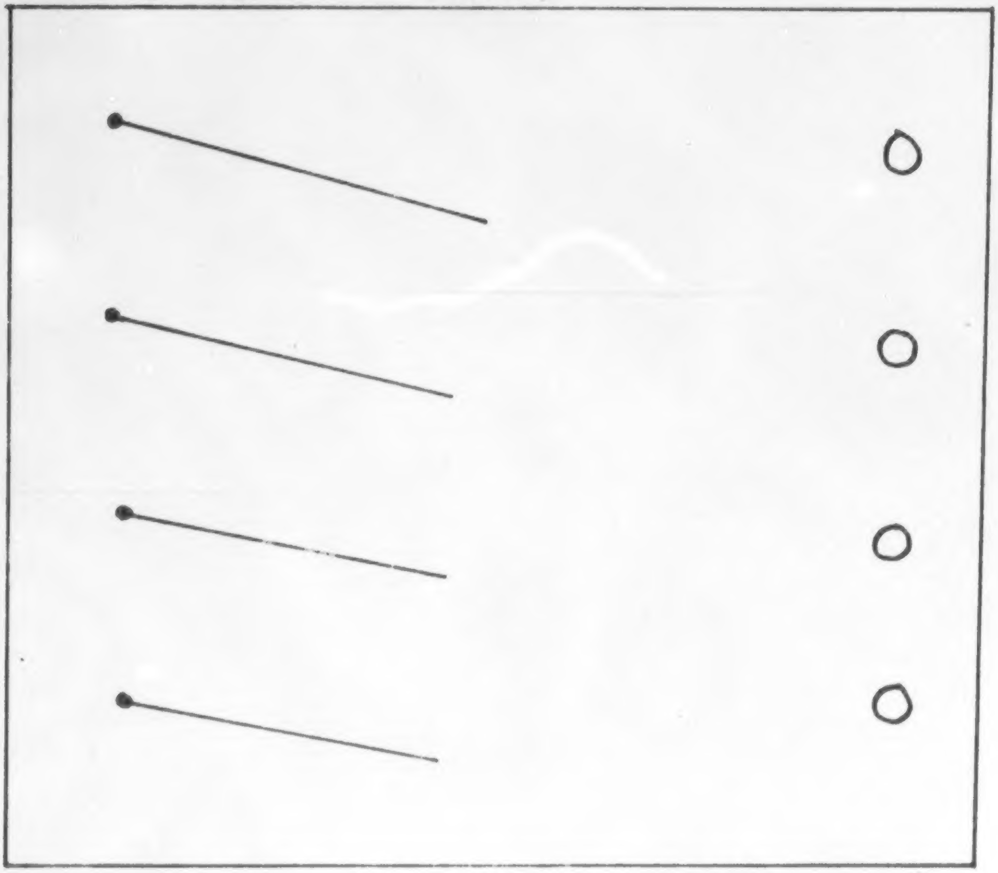
(5)

Wind Gauge


brad
straw
1
2
3
4
5
Card board

K-3 Concept # 6, First Grade Activity h

(6)



BATTERY IN BACK

Self-correcting bulb and battery match game
Connect each bulb to the battery in series on the back of the board.